

November 22, 1956

The IRON AGE

The National Metalworking Weekly



How Ceramics Fight Wear Problems P.91

Checklist For Hiring Executives P.59

The South: Metalworking Paces Its Growth P.51

Digest of the Week P-2

THE OTHER TURN



WHY NOT DESCRIBE
YOUR OPEN-HEARTH
CARTOON IDEA AND
SEND IT ALONG TO US?

The benefits steelmakers obtain from our refractories are in part a result of Basic's on-the-job servicing. One of the rewards of this close relationship has been the opportunity to observe and appreciate the lighter side of these usually serious craftsmen.



BASIC INCORPORATED

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The workman above is installing a Davis brake beam on the truck of a freight car. The special rolled section used in making the beam is shown in the inset.

A special section is the backbone of this railroad car brake beam

Strength—Long Life—Safety. These are the requisites of a railroad car brake beam. That's why the Davis Brake Beam Company, manufacturer of Unit and Hanger type brake beams that are extensively used on freight and passenger cars, construct their product with a hot-rolled carbon-steel special section.

This section consists, in effect, of a round bar and a tee. The customer slits the section from a point near each end, separating the round from

the tee. Then, by compressing the beam, he foreshortens the tee, forcing the round outward. The result is what the Davis people call "Solid Truss" construction. Such a brake beam combines strength, durability and reliable performance that cannot be matched by others built up by bolting or by welding.

Whatever your product may be, we urge you to consider whether it couldn't be made better with special sections—made more efficiently, too,

because the use of special sections usually means less machining and fewer fabricating operations. And what company leads in the production of special sections? The nearest Bethlehem district sales office will gladly give you the answer.

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BETHLEHEM, PA.

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BETHLEHEM STEEL



Nov. 22, 1956—Vol. 178, No. 21

The IRON AGE

Digest of the Week in Metalworking

Starred items are digested at right.

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NEWS DEVELOPMENTS**SOUTH WIDENS ITS****METALWORKING BASE**

P. 51

Former topheavy picture of defense industries gives way to balanced in-



dustrial base. Textiles no longer dominate South's industry. Big companies expand operations in southeastern states.

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Address mail to The IRON AGE
Chestnut and 56th Sts. Philadelphia 39, Pa.

FOREMEN: THEY ARE KEYS**TO TEAMWORK**

P. 54

The National Management Assn. has been plugging away for 30 years at the need for training foremen. Its clubs, which number in the hundreds, have saved member companies thousands of dollars.

WESTINGHOUSE DRAMATIZES**SCIENCE TALENT HUNT**

P. 55

By labeling its yearly scholarship competition a "talent search," Westinghouse effectively dramatizes it. Over 15,000 high school seniors compete for honors. Ninety pct of the finalists get their degrees.

BUSINESS INTERRUPTION**INSURANCE STUDIED**

P. 57

Plant shutdown losses often exceed property damage. That's why it's important to look into so-called business interruption insurance. American Management Assn. develops thought-provoking angles of problem.



A MAJOR ADVANTAGE of many ceramic materials is that they can be cast to special shapes. Here brick form is installed as a lining. Article on page 91 emphasizes that modifications of even the simpler shapes can be used to aid design. (The Carborundum Co. photo.)

A CHECK LIST FOR EXECUTIVE SELECTION P. 59

American Institute of Management study indicates that ability alone is not enough for executive selection. Integrity and industry are equally important, should be given more weight in executive selection. This check list could be an important aid in pinpointing qualifications for top jobs.

FEATURE ARTICLES

GET BETTER WEAR RESISTANCE WITH CERAMICS P. 91

In the battle against wear, ceramic-type materials are beginning to take the lead. For many industrial applications they are cheaper than special alloys and superior in terms of life span. This article brings you up-to-date on many of the ceramics now available.

HOW MEASUREMENTS LEAD TO EFFECTIVE QUENCHING P. 95

Accurate temperature measurements are taking the guesswork out of quenching, making the heat treater's job easier and much more scientific. Secret lies in continuously recording temperature change in the quench. Reviewed here with an aim at providing practical answers are such questions as: How effective is an agitated quench. Still water? Quenching in brine?

COMPUTERS FOR SHORTCUTS TO BETTER MACHINABILITY P. 98

A variety of metalworking plant problems are being solved by machinability computers. Feed them the proper "knowns" and they serve up, from reams of stored data, the information sought. Some of their uses are troubleshooting, training, setting time standards, and making realistic cost estimates.

WHAT TECHNIQUES GRIND ZIRCONIUM BEST P. 100

While it doesn't grind as easily as low carbon steel, zirconium can be ground successfully at conventional speeds. In general, silicon carbide wheels work best, although combination silicon carbide-aluminum oxide has its place. Here—as determined in a Carborundum Co. test program—is an evaluation of surface, cylindrical, centerless, internal, snagging and cutoff grinding.

SANDWICH STRUCTURES PERMIT HIGHER LOCAL LOADING P. 104

Bonded sandwich structures, originally developed to save weight in aircraft construction, are gaining a foothold in other industries, too. A number of simple and generally acceptable designs now exist as standards for joints, edge members and inserts.

MARKETS AND PRICES

JETS DOMINATE AIRCRAFT ENGINE MARKET P. 60

With military's needs dominating, jet engines are pacing the industry's growth. High development costs and rapid obsolescence cause production headaches. Piston engines, however, will continue a major market factor for at least the next ten years. Metalworking feels impact of jet's arrival.

NEXT WEEK:

WHY U.S. LOOKS TO IMPORTED IRON ORES

This year 77 pct of our iron ore needs comes from domestic sources. By 1975, however, this figure could drop to 59 pct. Here is the world iron ore picture with U. S. usage of the material forecast to 1975. (Iron Ore Co. of Canada photo.)

PARTS MAKERS VIE FOR NEW MARKETS P. 68

Keeping in step with the automakers is a tough job for parts makers. It's feast one year, famine the next. Many are going in for diversification in a big way. One large outfit, AC Spark Plug Div., sells only a third of its parts to GM.

MACHINE BUILDERS SET FOR M-DAY SIGNAL P. 77

If the warm war turns hot, U. S. machine makers are ready to start on a \$256 million tooling program at a signal from the ODM. The goal: 15,500 general purpose machines in 6 months or less. ODM is having trouble getting a similar program going for big "elephant" tools.

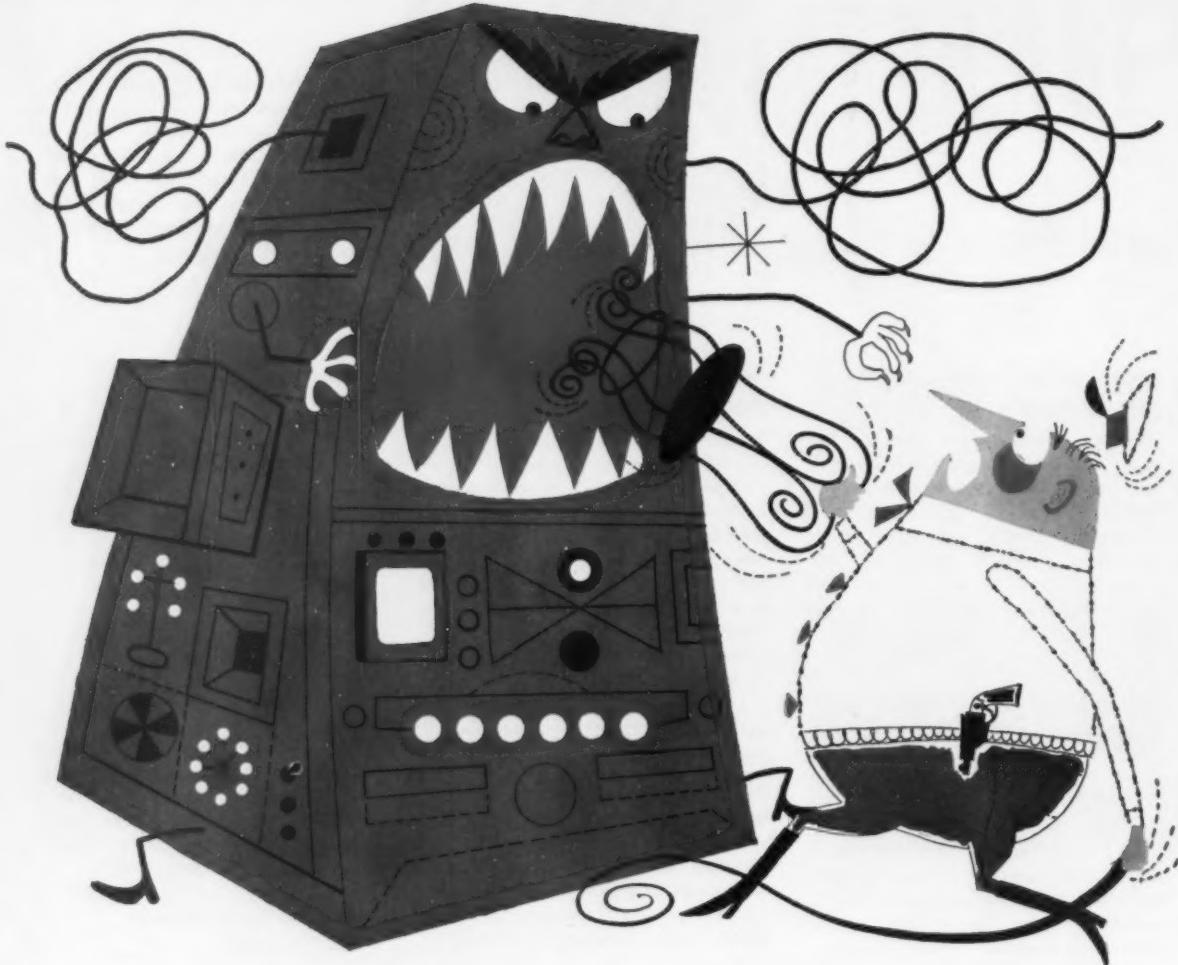
STEEL MARKET IS TIGHTER THAN IT LOOKS P. 131

Don't lose sight of the forest because of the trees. The steel market, already tight, is getting tighter despite record production. Apparent lethargy of auto producers is only partially true.

SUEZ INCREASES TAX WRITE OFF CHANCE P. 132

Crisis in the mid-East and resulting pressure for stepped up oil and tanker production has improved prospect for tax write offs on building facilities for heavy plate and oil country tubular goods.





Taming a wire fabricating machine?

Call American Steel & Wire!

Wire machines can be ornery. They seem to have a brain that delights in fouling up a high speed production line.

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At AS&W, we use a lot of wire in our own plants, and have learned a lot of little tricks that are yours for the asking. Just call your American Steel & Wire representative.

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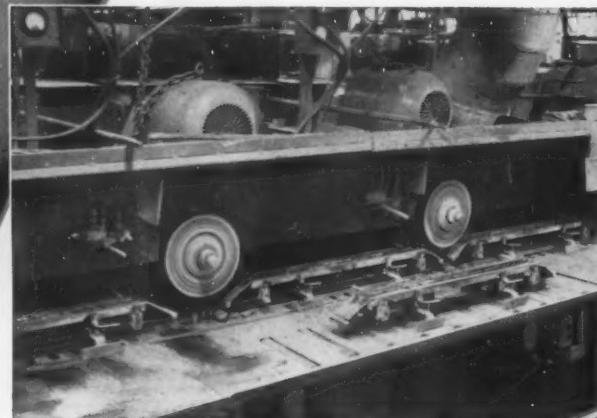
AMERFINE—high quality fine wire.
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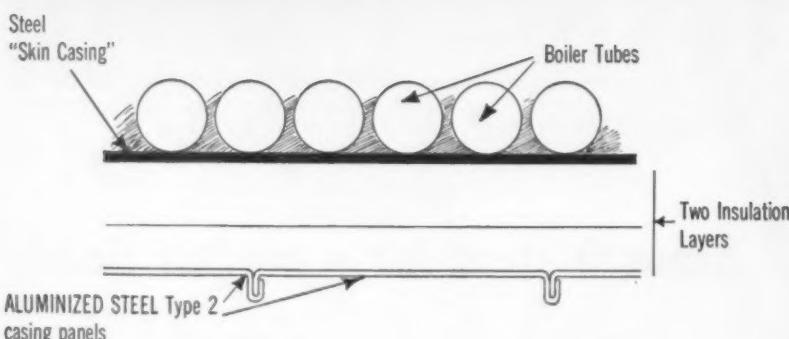
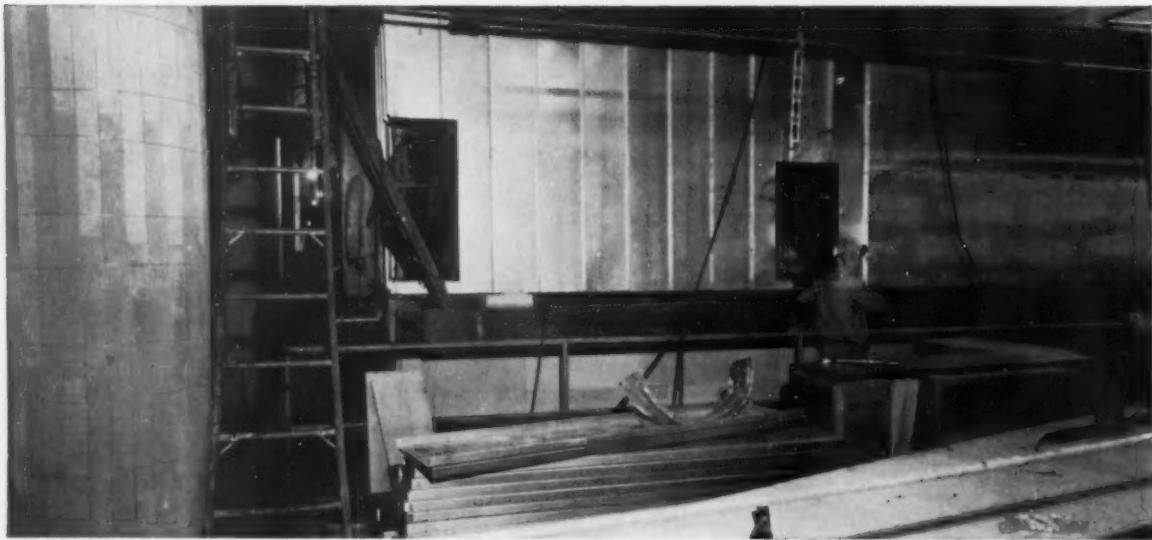
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BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

Osborn Brushes

New Armco ALUMINIZED STEEL Type 2 protects giant boilers



Interlocking panels made of Armco ALUMINIZED STEEL Type 2 make up an easily-erected, low maintenance outer covering for this boiler. Between this covering and the sheet metal "skin casings" next to boiler tubes are two layers of insulation.

Casings for the big boilers and duct work at Detroit Edison's River Rouge Power Plant must be damage-resistant and easy to maintain. That's why Armco ALUMINIZED STEEL® Type 2 was specified for these casing panels.

Maintenance men at the plant say non-metallic casings are more easily damaged and create "housekeeping" problems in installation and maintenance. In contrast, strong, easily-erected panels of Armco ALUMINIZED STEEL Type 2 not only resist damage but stay attractive with little or no upkeep. The patented hot-dip aluminum coating on this special steel resists corrosion — makes painting unnecessary.

what 17-year tests show

Seventeen years of testing in an industrial atmosphere show this about the corrosion resistance of Armco ALUMINIZED STEEL Type 2: The life of the aluminum coating in atmospheric service is at least three times that of a standard zinc coating on galvanized steel sheets. (The steel was tested 15 years before it was produced commercially.)

Wherever you need a sheet steel for atmospheric service, it will pay you to consider ALUMINIZED STEEL Type 2. For more information about this newest Armco Special-Purpose Steel, just write us at the address below.

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Indexed in the Industrial Arts Index
and the Engineering Index.



EDITORIAL

How Bad is the Suez Aftermath?

♦ THE MIDDLE EAST fracas will be felt for a long time. It is the worst thing that could have happened to us and to our allies. Because of it the Reds never had it so good.

Some gain may come out of the catastrophe. But there is no use of kidding ourselves. Great Britain and France have been thrown for a loss. So have we.

Before the Canal is repaired we must repair the damage done between America and her friends. If we don't we guarantee great victories for Russia. We can't afford that after the huge "dividend" just paid to her.

Oil loss to Great Britain and Europe will crimp seriously the economy there. What happens in Western Europe affects us. Inflationary waves from across the ocean can only aggravate our own.

Our allies need help immediately. Before Suez their economy was strained. Now the situation is worse. Oil from the Western Hemisphere means more dollars will be needed. Longer hauls from the Persian Gulf mean spending more money for new tankers and for existing transportation.

Any setback in business and industrial conditions in France and Great Britain spells a gain for Russia. Placing the blame for the Middle East trouble is something that will just have to wait.

Just how far back the Free World has been pushed may not be understood clearly. That Russia has her own satellite troubles doesn't help us. That must be matched with our own troubles—which still leaves the Reds with a big balance in the Middle East.

Asiatic — and African — nations may not fall completely for Russian double-talk. But they do listen with an attentive and "appreciative" ear. The sickening-sweet Moscow blurbs have struck home among most Asiatic nations.

The most terrible thing that could happen to us and to our friends would be a sudden rebirth of rabid isolationism in the United States. That would be tragic if it gained a strong foothold in our national thinking.

We don't have too much time for soul-searching. There is a lot of diplomatic, financial, and industrial work to be done.

The Russian vultures are circling over us!

EDITOR-IN-CHIEF

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for welding you can count on
to produce MORE PROFIT



HOBART'S NEW
AC/DC WELDER

Rarely do you find such versatility, welding range, great speed and extra features in one welder as you do in this brand new Hobart AC-DC welder. This new Hobart lets you take full advantage of the latest types of electrodes and sizes for both AC or DC welding.

In addition to having AC or DC welding, you'll want to see and know about variations of this model that lets you do Inert Gas Welding. Such outstanding advantages in Hobart are typical. You can depend on every Hobart welder to give you constant top performance, cooler operation, easier arc control and extra capacity.

HOBART BROTHERS CO., BOX IA-116,
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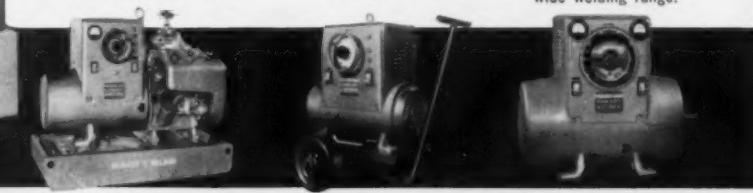
"HUSKY BOY" low cost light-weight aircooled 200 amp. welder for general shop and outside repair work.



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Try Hobart's new Rocket 14, Rocket 24 and Rocket 27 for a real surprise . . . you'll marvel at their speed, ease of handling and their sound, strong welds.

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dear editor:

letters from readers

Summing Up

Sir:

Your editorial, "Our Foreign Policy Is Sound!" (Nov. 8 issue) is right to the point.

You have summed up very accurately the opinion which many of us have regarding our foreign policy.

I should like to be one of the first to congratulate and commend you for this timely editorial. A. E. Raynor, Mgr., Proposition Dept., The Babcock & Wilcox Co., New York, N. Y.

Getting Acquainted

Sir:

Even if I were not hospitalized lately, Dr. Harry J. Johnson's article "The Ten Commandments of Executive Health" in your Nov. 8 issue would interest me. It is so valuable and instructive in nature that I feel it should have a very wide circulation. Many individuals who may not be receiving your publication are missing out on some very important and timely tips. S. Stein, Peerless Mayer, Inc., New York, N. Y.

New Thermocouple

Sir:

On p. 53 of your October 11 issue you mention a new thermocouple which shows excellent stability over a range of 2000°.

We would like to have more information on this thermocouple. Will you please put us in touch with the manufacturer? W. R. Klinkicht, Vice Pres. & Ass't General Mgr., The Pollak Steel Co., Cincinnati, Ohio.

Write to Driver-Harris Co., Harrison, N. J.—Ed.

November 22, 1956

Taft-Hartley

Sir:

Would you be good enough to send me three or four reprints of the special report of the Taft-Hartley Law in your October 4 issue? I'm very much impressed with the way you have handled the article. S. S. Patterson, Associate Director, Industrial Relations Div., National Association of Manufacturers, New York, N. Y.

Sales Tool

Sir:

Let me refer you to the article "The Swing to Sintered Ore," your October 18 issue.

I have been asked to obtain reprints of this article if they are still available—say 8 or 9 of them. It was very interesting and may prove quite worthwhile to our sales organization. L. H. McReynolds, Adv. Mgr., The Jeffrey Manufacturing Co., Columbus, Ohio.

Tearsheets are available.—Ed.

THE IRON AGE



"Would someone please show the men how to use the equipment!"

NOW
L&I
introduces

Highest
Precision

DRILL &
REAMER
BLANKS

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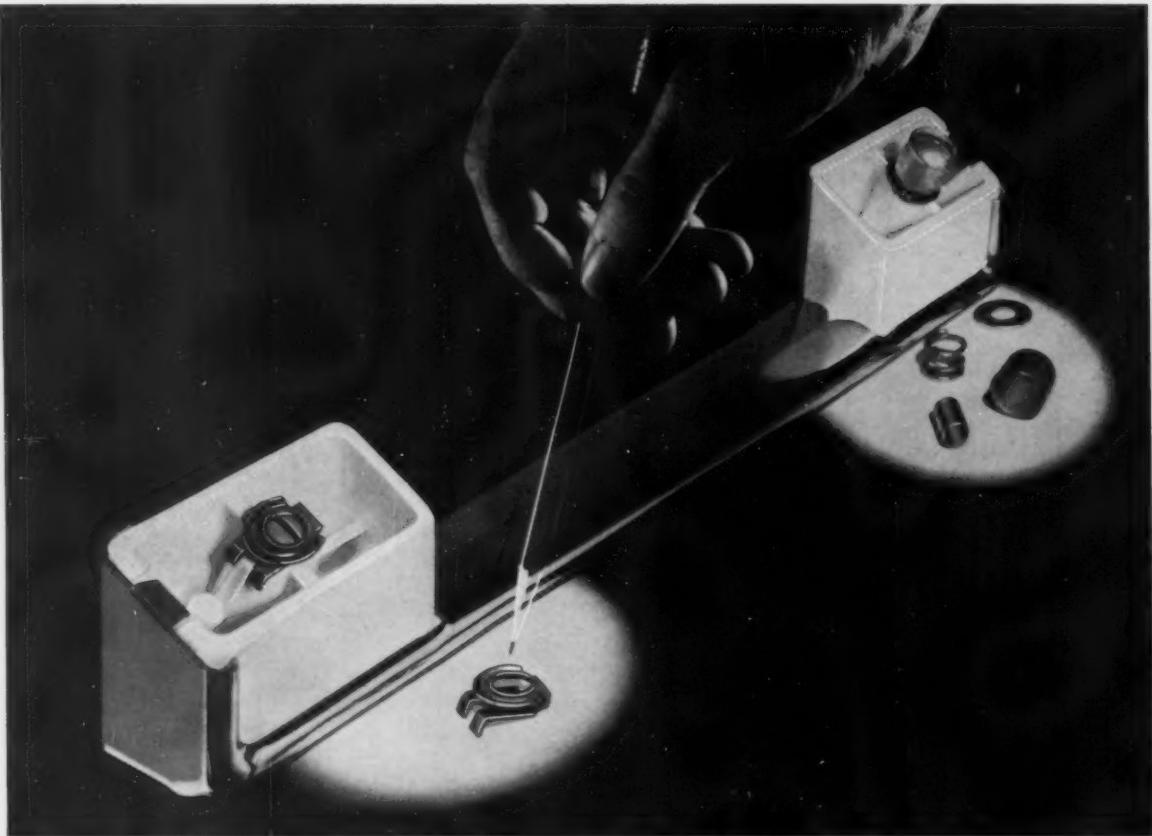


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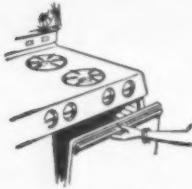


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Engineered by Tinnerman...

One-Piece SPEED CLIP® replaces 4-part fastener, helps assembly and shipping... and saves money!



Four separate parts plus screw were required to fasten each end of the removable door handles on kitchen ranges manufactured by the Caloric Appliance Corporation, Topton, Pennsylvania.

Tinnerman fastening specialists teamed up with Caloric designers to eliminate 3 of the parts!

Now . . . a special one-piece, multi-purpose SPEED CLIP plus screw do the same job more efficiently and at lower cost, and reduce small parts handling. Faster, easier assembly . . . fewer parts to buy, inventory and handle. Packed

inside the oven for safe shipment with SPEED CLIPS in place, the door handles are dealer-applied in far less time, can be easily removed by the housewife for cleaning.

The resiliency of the spring steel SPEED CLIP prevents crazing or chipping, enables it to absorb varying panel thicknesses and porcelain enamel build-up. Changeover was made without retooling or redesigning door handle or keyhole-shape mounting holes.

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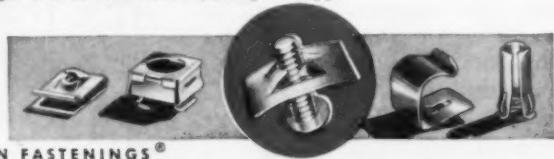
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TINNERMAN

Speed Nuts

FASTESt THING IN FASTENINGS®



fatigue cracks

Report from the South

George McManus, our Pittsburgh editor, is a slow-talking Irishman with, of all things, a slight drawl. And you can't hardly find an Irishman with a drawl. Very rare, indeed.

George's drawl is sort of beguiling, which is what all Irishmen, particularly the colleens, are supposed to be. So we weren't at all surprised when he came back from a recent trip to the South with a whing-ding two-part piece on southern metalworking.



Westinghouse's Micarta Div. in S. Carolina

George came back loaded with reams of valuable background information and statistics on what is happening industrially in the South. As the ad men like to say, you can't afford to miss this report from the South on p. 51.

And here are some of the companies and people that made George's story possible:

Harris Foundry & Machine Co., Cordele, Ga.; Atlantic Steel Co., Robert Lynch, president; Harold Johnson, vice president, sales; U. S. Pipe & Foundry Co., C. S. Lawson, president; Tennessee Coal & Iron Div., David Challis, vice president, sales; Connors Steel Div., Campbell Blake, general manager; Ingalls Industries, Robert Ingals, president; Alabama Power Co.; Federal Reserve Bank, Atlanta.

Defends "Enches"

Well we've had it. A few weeks back we said the word "quench" doesn't pack a strong enough wallop. We also noted that some foreign words seem to do a better job in getting across the feeling of some metalworking operations.

Now one (maybe all?) of the readers of this column has risen to defend good old Anglo-Saxon quench. Here is part of his letter:

"I do not agree that quench is a weak word. There are many strong "enches" in the English language, such as "stench" and "entrench." The squeezing action you mention could be applied to a wench, but a wench can also be an Amazon. "Qu" implies speed as in quick and the "ench" sound bites the word off abruptly. "Clench" is another strong word, even more so than "clinch," which, to be effective, must have a connotation of relaxation. I like "quench."

"Abgezchreckt von 1500° in wasser" may be an excellent phrase in Germany. But I don't think we should try to take it away from the Germans because our national rating in spelling would be bound to suffer."

From now on we'll watch our "quenches" and "wenches" as well as our "p's" and "q's." And thanks to W. W. Bell of the Lummus Co. for "clinching" his point.

Puzzlers

Looks from this hemisphere that Mr. A is 55 years old (Nov. 1 puzzler). Winners: R. Roseman, The Glidden Co., Baltimore; Patricia Trimble, RCA, Camden, N. J.; Arthur Schwartz (The Finkel Umbrella Frame Co., N. Y. C.; the GSCC Calculating Dept.; Arlan Walker, Iowa Ordnance Plant, Burlington, Iowa; and C. W. (nevermiss) McKinley.

Hyde Park
RED CIRCLE
ROLLS
ALLOY-CHILLED

Gray Iron Castings

Hyde Park Castings up to 80,000 pounds are sound, accurate and physically dependable. Precision machining is done by skilled craftsmen in our modern machine shop. Send your blue prints for quotation.



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For finer finish, long life and greater tonnage, specify Red Circle Rolls.

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FOUNDRY & MACHINE CO.
Hyde Park, Westmoreland County, Pa.
ROLLS
ROLLING MILL MACHINERY
GREY IRON CASTINGS



One set-up saves 30%

Photos courtesy of the Kelman Electric & Mfg. Company, Los Angeles, California.

Boring, facing, and high speed drilling with one set-up cut the floor to floor time about one-third on this job.

The Kelman Electric & Mfg. Company say their Cincinnati Super Service Radial Drill "handles easily, is very accurate and versatile."

They are facing 6" diameters; drilling for $\frac{1}{2}$ " bottom tap, and tapping with a $\frac{1}{2}$ " bottom tap on this job.

The part being processed is a Bronze Top Casting.

Cincinnati Super Service Radial Drills are profit makers in this shop, and they could be in yours.

Write for Bulletin R-21C

**CINCINNATI
BICKFORD**



RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
OAKLEY, CINCINNATI 9, OHIO, U.S.A.

dates to remember

NOVEMBER

The American Society of Mechanical Engineers—Annual meeting, Nov. 25-30, Statler Hotel, New York. Society headquarters, 20 W. 39th St., New York.

Wire Reinforcement Institute, Inc.—Fall meeting, Nov. 26-27, The Jung Hotel, New Orleans, La. Society headquarters, National Press Bldg., Washington 4, D. C.

Society for the Advancement of Management—Annual operations research conference, Nov. 26-30, Hotel Commodore, New York. Society headquarters, 74 Fifth Ave., New York.

EXPOSITION

Third International Automation Exposition—Nov. 26-30, New York.

DECEMBER

Institute of Appliance Manufacturers—Year-end conference, Dec. 3-4, Netherland Plaza Hotel, Cincinnati, O. Society headquarters, The Shoreham Hotel, Washington, D. C.

American Institute of Mining, Metallurgical, and Petroleum Engineers—Annual Conference, Dec. 5-7, Morrison Hotel, Chicago. Society headquarters, 29 W. 39th St., New York.

American Institute of Chemical Engineers—Annual meeting, Dec. 9-12, Statler Hotel, Boston. Society headquarters, 25 W. 45th St., New York.

The Material Handling Institute—Annual meeting, Dec. 10-11, Biltmore Hotel, New York. Society headquarters, One Gateway Center, Pittsburgh, Pa.

JANUARY

Institute of Scrap Iron & Steel Inc.—Annual convention, Jan. 13-16, Eden Roc and Fontainebleau Hotels, Miami Beach, Fla. Society headquarters, 1729 H St., N.W. Washington, D. C.

Society of Automotive Engineers, Inc.—Annual meeting, Jan. 14-18, The Sheraton-Cadillac and Statler Hotels, Detroit. Society headquarters, 29 W. 39th St., New York.

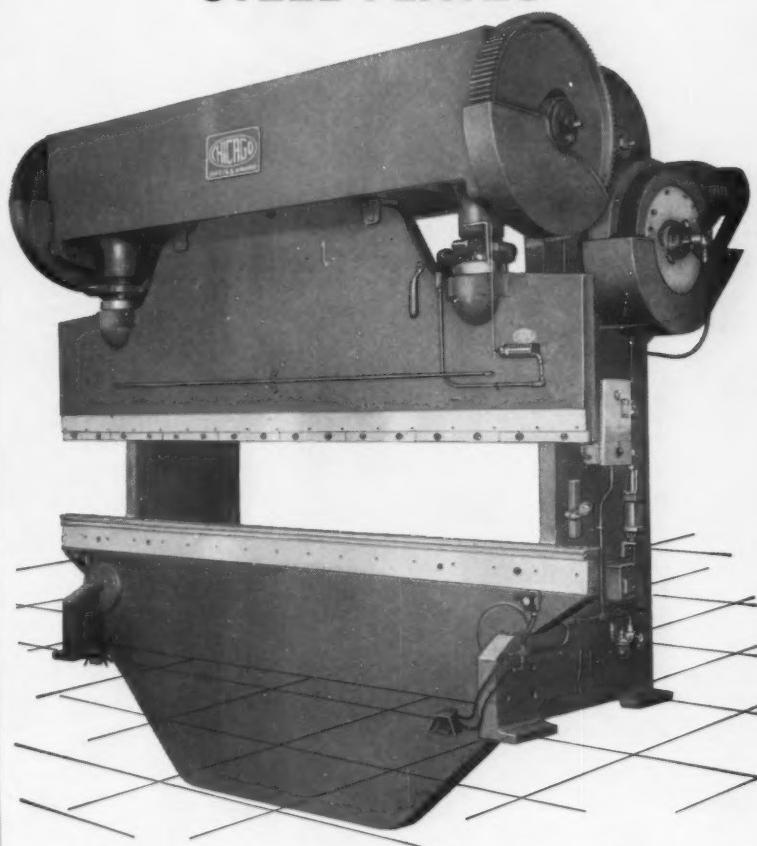
The Society of Plastics Engineers, Inc.—Annual national technical conference, Jan. 16-18, Hotel Sheraton-Jefferson, St. Louis, Mo. Society headquarters, 34 E. Putnam Ave., Greenwich, Conn.

Compressed Gas Assn., Inc.—Annual meeting, Jan. 21-23, Waldorf-Astoria, New York. Society headquarters, 11 W. 42nd St., New York.

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DREIS & KRUMP

Press Brakes

FOR BENDING • FORMING STEEL PLATES



The most modern design throughout with all the features for the fastest bending and forming of steel plates. Large variety of standard sizes and capacities. Also modified designs for special production work.

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Announcing
the NEW Cross
Chuckинг
Transfer-matic

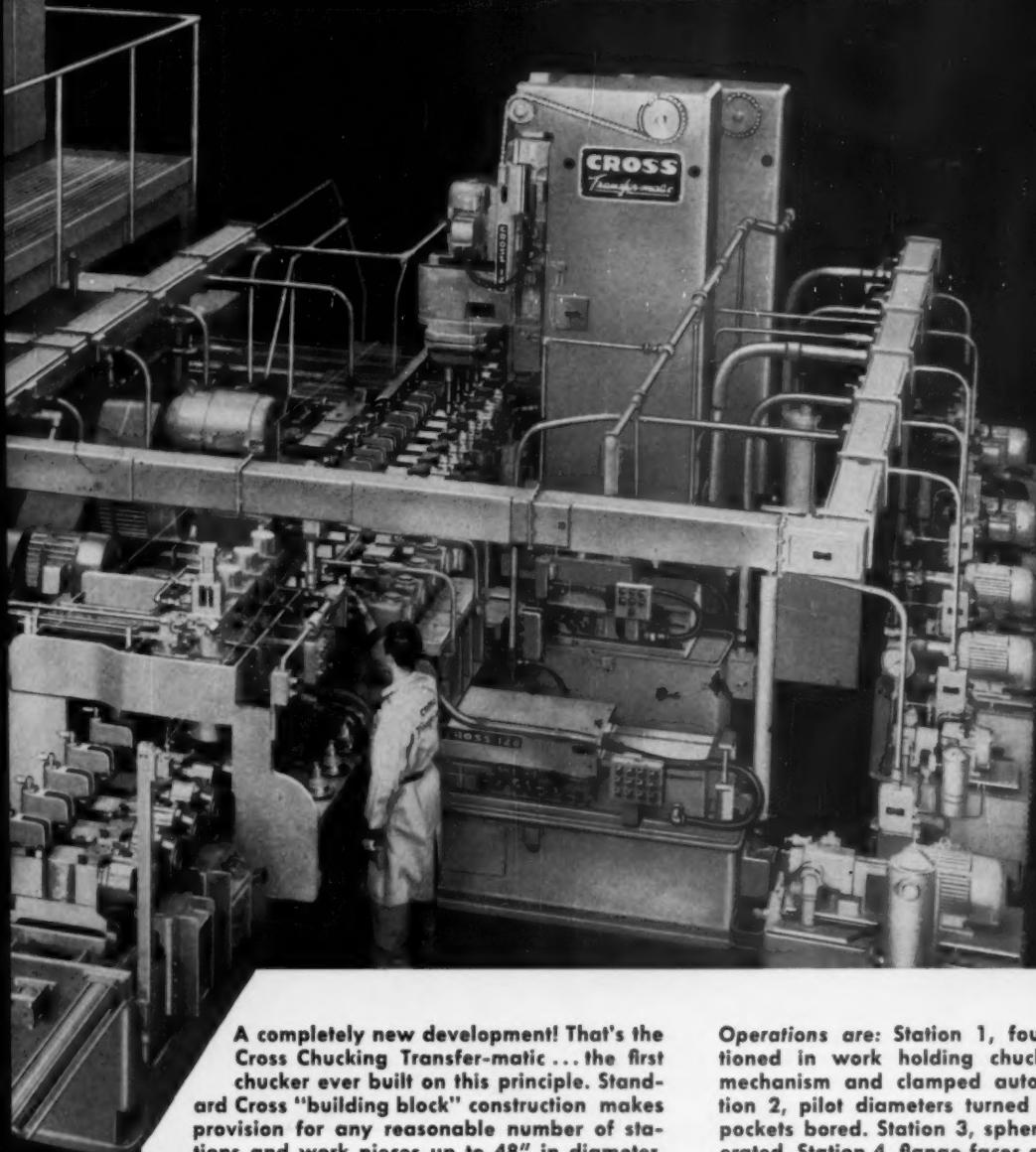
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Station 1

Station 4

Another Automation First by Cross



A completely new development! That's the Cross Chucking Transfer-matic...the first chucker ever built on this principle. Standard Cross "building block" construction makes provision for any reasonable number of stations and work pieces up to 48" in diameter. This particular seven station Transfer-Matic, created for differential gear cases, has a rated capacity of 368 pieces per hour at 100% efficiency.

An unusual feature is that the work pieces are chucked and not released until all operations are complete. The chucks are mounted on precision spindles, which in turn are carried on pallets—four to the pallet. There are ten pallets—one at each station and three on the conveyor moving from Station 7 to Station 1.

Operations are: Station 1, four pieces positioned in work holding chucks by loading mechanism and clamped automatically. Station 2, pilot diameters turned and side gear pockets bored. Station 3, spherical seats generated. Station 4, flange faces and thrust faces for side gears generated. Station 5, pin hole for pinion shaft drilled after spindles are indexed into pre-determined position and locked to prevent rotation. Station 6, pin hole chamfered top and bottom. Station 7, pin hole rough and finish reamed with shuttle head.

Features include construction to JIC Standards, hardened and ground ways, interchangeability of all parts, pre-set tooling and programmed tool changes with the Cross Machine Control Unit.

Established 1898

THE **CROSS** CO.
First in Automation
DETROIT 7, MICHIGAN

Waterbury Farrel Wire Flattening MILLS IN ACTION

Pictured here are a few of the many Wire Flattening Mills designed and built by Waterbury Farrel. Each installation was custom-engineered to fit the production requirements of each individual customer.

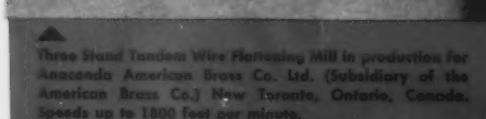
Whether your requirements call for a single or multiple stand mill, Waterbury Farrel can supply you with a reliable production unit that will prove to be a profitable investment.



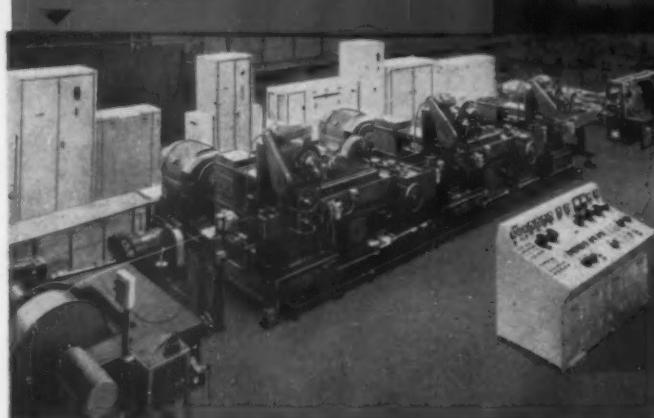
Two Stand Tandem Wire Flattening Mill of National Electric Coil Co., Columbus, Ohio. Speeds up to 1000 feet per minute.



Two Stand Tandem Wire Flattening Mill recently installed at John A. Roebling's Sons Corp., Trenton, N. J. Speeds up to 1500 feet per minute.



Three Stand Tandem Wire Flattening Mill in production for Anaconda American Brass Co. Ltd. (Subsidiary of the American Brass Co.) New Toronto, Ontario, Canada. Speeds up to 1800 feet per minute.



Write today for your free copy of *Wire Flattening Mills, Cir. No. 731-R.*



WATERBURY FARREL

THE WATERBURY FARREL FOUNDRY
& MACHINE CO. Waterbury, Conn.

Sales Offices:
Chicago • Cleveland • Millburn, N. J.



Bolt, Nut & Screw Machinery



Power Presses



Rolling Mill Machinery



Wire Mill Equipment



Sendzimir Mills and other Special Machinery

**steel turnings
can be mighty
troublesome
until they're
reduced to this size**



Feeding steel turnings to the Jeffrey crusher as they come from the machines.



From the crusher, the reduced metal now goes to the centrifugal oil separator.



Jeffrey bucket elevator carries scrap to storage for delivery to trucks.

You haul only one-third the volume of scrap, and it's much easier to handle after you put your metal turnings through a Jeffrey crusher. Scrap brings a better price and it is practical to spin the turnings to salvage the cutting oil that clings to it.

You save on labor, get more money for your scrap, and reclaim valuable coolants. Thus you greatly increase the earning capacity of your salvage department.

Whether your problem is crushing turnings, pulverizing coal, shredding wood or grinding some other substance, there's Jeffrey know-how and equipment to help you. Bulletin 837-A describes it. The Jeffrey Manufacturing Company, Columbus 16, Ohio.



JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT •
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING



The unique air-blast test device shown above makes possible one of the most accurate accelerated spalling tests in the basic refractories industry.

Following is an example of how Kaiser Chemicals research laboratories use the test to help develop Periclase Chrome brick with stronger bonds, lower thermal expansion and higher conductivity (the three "musts" for spall-resistant brick):

"Whistling Wind" Creates Heat Differential

First, 3" x 3" x 6" samples of pre-fired brick are placed in a furnace and brought up to test temperature.

Next, the samples are removed from the furnace and placed immediately in the test device. Unheated insulating brick cover all sides and the bottom of each hot sample, leaving only one 3" x 3" end of each brick exposed.

Then, high-pressure jets of cold air are blown directly onto the exposed ends of the glowing

bricks. This "Whistling Wind" air blast shock-chills one end of each brick . . . while the rest of the brick remains red-hot!

Tests Brick's Ability to Resist Spalling

After a measured air-blast cooling period, the bricks are inspected and cracks (if any) recorded. The bricks are then placed in the furnace again to repeat the cycle. A record is kept for each test cycle, and failure is recorded when a brick separates.

Research Lengthens Brick Service Life

This unusual test is just one example of the thoroughness and originality of Kaiser Chemicals Research. From it—and from many other unique tests—come special refractory compositions such as Kaiser Periclase Chrome brick that assure open hearth operators of less spalling, less swelling and greater resistance to alteration by oxides and slags. Good reasons why more and more open hearth operators say:

"Kaiser Periclase Chrome Brick Last Longer"



For this unique spall test, "Whistling Wind" chill-blasts one end of each brick while the rest of the brick remains red-hot.

MORE REASONS WHY KAISER PERICLASE CHROME BRICK GIVES YOU BETTER SERVICE:

1. **Low Chromite Content.** Chromite content is the minimum amount necessary to provide thermal shock resistance, (only 9.1% Cr₂O₃). Lowering of chromite also reduces swelling in presence of iron oxide, thus minimizes buckling and peeling.
2. **Uniform High Strength** because the ceramic bond is formed BEFORE the chemical bond burns out.
3. **Outstanding Dimensional Stability** because there is no liquid phase in the conversion from chemical to ceramic bond. Nothing "melts out" to cause distortion or shrinkage.
4. **Excellent Resistance to Chemical Attack** by furnace fumes, iron oxides and slags is assured by high magnesium oxide content, maximum brick density, (low porosity), and chemically stable composition.

Call or write Kaiser Chemicals Division, Dept. S6131,
KAISER ALUMINUM & CHEMICAL SALES, INC., at any
of the addresses listed below.

PITTSBURGH 22, PA. 3 Gateway Center
HAMMOND, IND. 518 Calumet Building
OAKLAND 12, CALIF. 1924 Broadway

Kaiser Chemicals
Pioneers in Modern Basic Refractories

REFRACTORY BRICK & RAMMING MATERIALS • CASTABLES & MORTARS
MAGNESITE • PERICLASE • DEADBURNED DOLOMITE • ALUMINAS

HOW TO USE HALLOWELL ADJUSTABLE SHELVING IN YOUR PLANT



SELECT THE BASIC SHELVING UNIT

USE IT INDIVIDUALLY OR IN COMBINATION

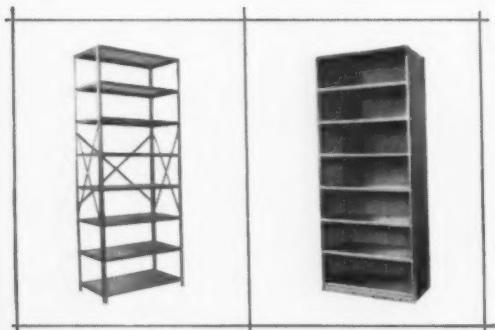
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ADD SLOPING SHELF UNITS
AND SHELF BOXES

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Sturdy Steel Construction

Interchangeable Parts Easy to Assemble

Stocked by Leading Shop Equipment Dealers

Send for Catalog 2111 - Hallowell Shop Equipment Division

Standard Pressed Steel Co., Jenkintown 17, Pa.

HALLOWELL SHOP EQUIPMENT DIVISION

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IT'S EASY TO ORDER THE BEST DRILL FOR THE JOB

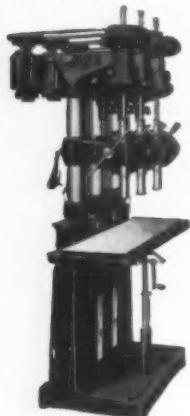
From this "Buffalo" Line

- 1 CAPACITY RANGE from the smallest commercial drill sizes to $1\frac{1}{2}$ " in mild steel.
- 2 CHOICE OF FEEDS — sensitive or power feed, hand or foot controls.
- 3 CHOICE OF SPINDLE SPEEDS — optional motor speeds and adjustable V-belt drive for the right drilling, tapping or reaming speed; or variable speed drive in the famous "RPMster".
- 4 CHOICE OF ONE TO SIX SPINDLE MODELS for single or multiple operations in all capacities.
- 5 ACCESSORIES — such as slow-speed, tapping and mortising attachments, work lights, vise tables and coolant systems.
- 6 ARRANGEMENTS — horizontal duplex, radial, inverted head and many others to make more jobs easier.

BUILT-IN ACCURACY, CONVENIENCE, LONG LIFE

For 79 years, "Buffalo" has been building exclusively industrial drills with the best and most practical features, which we call the "Q" Factor[®]:

- 1 PRECISION BALL BEARING SPINDLES — high grade steel, ground, polished and dial gauge tested for trueness; take-up adjustment of ball bearings for wear.
- 2 CONVENIENT CONTROLS, table and head adjustment cranks for quickest and easiest handling — excellent visibility of all parts and work.



- 3 STRONG, RIGID CONSTRUCTION, including oversize columns, spindles, bases and true work tables. In pedestal models, ways are hand scraped.

*Write us about your drilling problem
— we'll mail you Bulletins and recommendations.*

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo" #216, 3-Spindle Pedestal Drill — Power Feed. $\frac{7}{8}$ " capacity in mild steel.

The "RPMster" — instant speed control from 100 to 3000 R. P. M.



BUFFALO FORGE COMPANY
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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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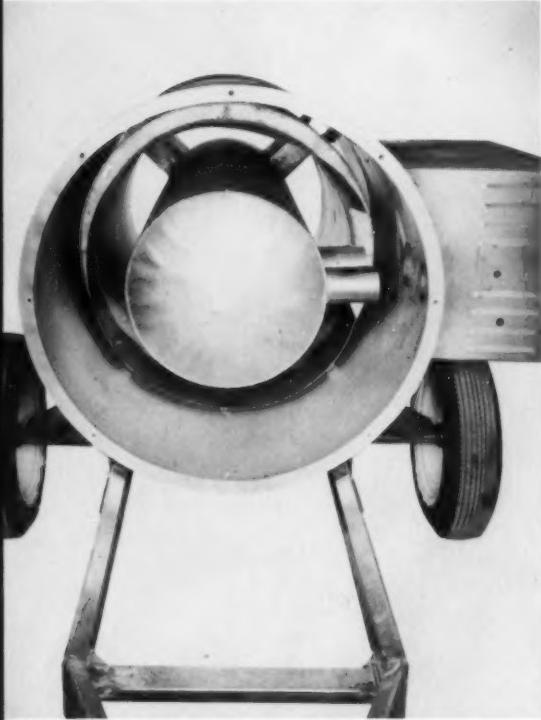
BENDING



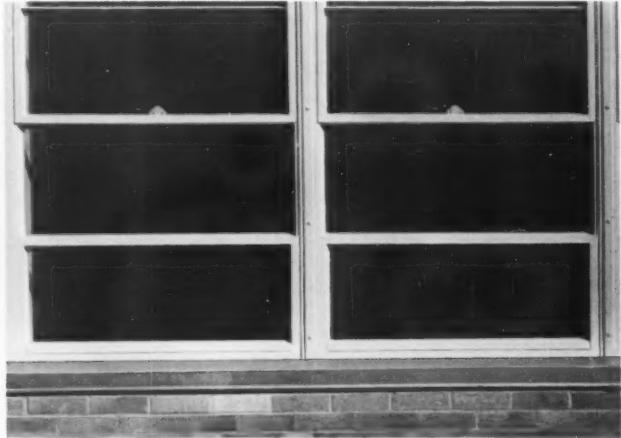
FOR TRAILERS THAT DO NOT WEAR OUT. This Fruehauf trailer has sides made from thin sheets of Stainless Steel, corrugated into walls that are only one inch thick. That's why it can carry more cargo than trailers of other, heavier types of construction. Most joints are welded, an easy job with Stainless. There is nothing to corrode or loosen; in fact, no Stainless trailer has ever worn out!



NOTHING *can equal* Stainless Steel



FOR HEAT RESISTANCE. This is a Lennox Crop Dryer. It burns 12 gallons of fuel oil per hour and has an input of 2,000,000 BTU. Wherever the heat is most intense, type 430 Stainless Steel is used. It is especially important for the combustion chamber and emitting tubes.



FOR ARCHITECTURAL USE. This Dawson Floating Sill is made from type 302 Stainless Steel. It combines fine appearance with the enduring properties of Stainless Steel. The finished job is neat and trim, and it will last as long as the building.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
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USS STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS
PIPE • TUBES • WIRE • SPECIAL SECTIONS



UNITED STATES STEEL

"This forging lost 33 tons along



says **Joseph Lacey**,
*Supt. of Machine Shops
USS Homestead
Forgings Division*



It was during the First World War, 38 years ago, that Joseph Lacey first toted his lunchbox as an apprentice machinist for United States Steel. He is now master of industrial machining, and has been entrusted with a large crew of machinists, inspectors and other experts who make USS Quality Forgings.

Visitors are always intrigued by the great difference between the ingot weight and the shipped weight of the forging. The picture, for example, shows a power station turbine rotor, one of our specialties. Forgings of this type have as much as 65% metal loss from ingot to shipped weight. Where and why did it go?

The nature of open die press forging on large ingots is such that considerable stock must be left on the various diameters of a contour forging. Top and bottom "crop" losses at the press, depending on various metallurgical factors such as ingot size and design, account for a considerable percentage of metal loss. However, other than "crop" losses, the open die press cannot remove large amounts of metal—this must be done in the machine shop.

When the forging arrives at the machine shop, special carbide tooling permits large amounts of steel to be "hogged off" through the use of high speeds and feeds and heavy cuts. This is known in the forging business as rough machining—fast removal of large amounts of metal. Rough machining is often accomplished in two stages—before and after heat treatment for physical properties. When specified, large masses of metal are removed in the preliminary rough machining operation known as "barking." After heat treatment, the machinist must "final rough machine" with sufficient stock allowance to permit the customer to finish the job to size in his machine shop.

So you can't skimp on steel if you want a superlative job—like a USS Quality Forging. A liberal, non-penny-pinching approach is needed, and that's what you get from United States Steel. Why not write for a free copy of our 32-page booklet that describes USS Quality Forgings? Address inquiries and booklet requests to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

the way"



USS QUALITY FORGINGS



heavy machinery parts . . . carbon, alloy, stainless
forged steel rolls and back-up roll sleeves
electrical and water wheel shafts
specialty forgings of all types

UNITED STATES STEEL



Roof arch of aluminum-melting furnace being fired up at Doehler-Jarvis Division of National Lead Company, Pottstown, Pennsylvania. "Steel Cast," a castable refractory containing Lumnite cement, made by Laclede-Christy Division, H. K. Porter Company, Inc., replaced brick arch roofs in 31 furnaces. Refractory-concrete roof arches reported in excellent condition after two years of service.

Furnace Refractories give top performance with **Lumnite*** Concrete.

In job after job, where extreme temperatures and thermal shock are encountered, experience has shown that Refractory concrete made with Lumnite cement will give excellent service in aluminum-melting furnaces, also in other furnaces of many types, large and small.

Refractory concrete can be easily placed, using your own plant work force. Service strength is reached within 24 hours. A convenient way to make Refractory concrete is with castables. These are packaged mixes of Lumnite calcium-aluminate cement and selected aggregates designed for your

specific job. They are prepared and distributed by leading manufacturers of refractories.

UNIVERSAL ATLAS CEMENT COMPANY

UNITED STATES STEEL  CORPORATION SUBSIDIARY
100 PARK AVENUE, NEW YORK 17, N. Y.

* "LUMNITE" is the registered trade-mark of the calcium-aluminate cement manufactured by Universal Atlas Cement Company.

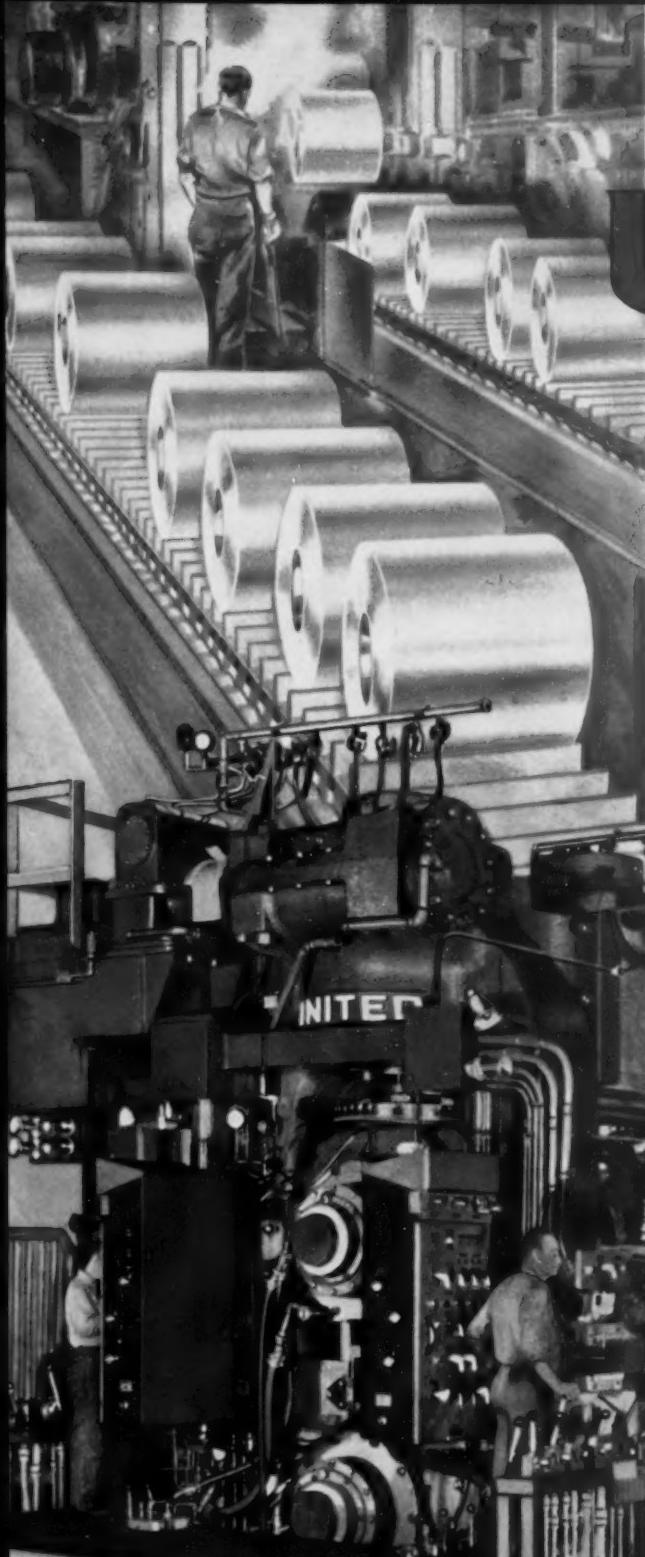
L-135

Atlas[®] Lumnite Cement

FOR INDUSTRIAL CONCRETES
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United States Steel Hour—Televised on alternate Wednesdays—See your local newspaper for time and station



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SUBSIDIARIES: Adamson United Company, Akron, Ohio
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Designers and Builders of Ferrous and Nonferrous Rolling Mills,
Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and
other heavy machinery. Manufacturers of Iron, Nodular Iron and
Steel Castings and Weldments.



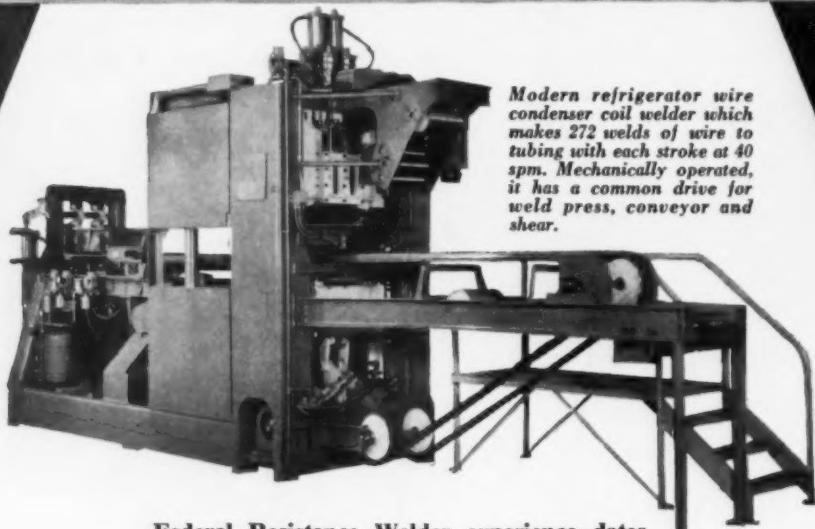
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beginning...

First experimental multi-spot welder model developed in 1901 for welding fan blades to hubs.

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**FIRST IN RESISTANCE
WELDING**



Modern refrigerator wire condenser coil welder which makes 272 welds of wire to tubing with each stroke at 40 spm. Mechanically operated, it has a common drive for weld press, conveyor and shear.

Federal Resistance Welder experience dates back to the very beginning of resistance welding. From that day to this, Federal has remained "First in Resistance Welding" engineering, design and development.



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WARREN, OHIO

B-RIGHT-ON®

SOCKET SCREW PRODUCTS

always measure up!



Socket screw users who want *what* they want *when* they want it know it pays to specify B-RIGHT-ON! Brighton Socket Screw Products *always measure up*.

Standard or special, Brighton Screws must meet and pass factory standards that are higher even than those specified by the ultimate user of the screws. Rigid control, from initial steel selection to final packaging, certifies every screw as B-RIGHT-ON quality.

Selected mill supply houses, Brighton distributors, complete the control chain, assure the user of service and delivery as dependable as the screws . . . B-RIGHT-ON service.

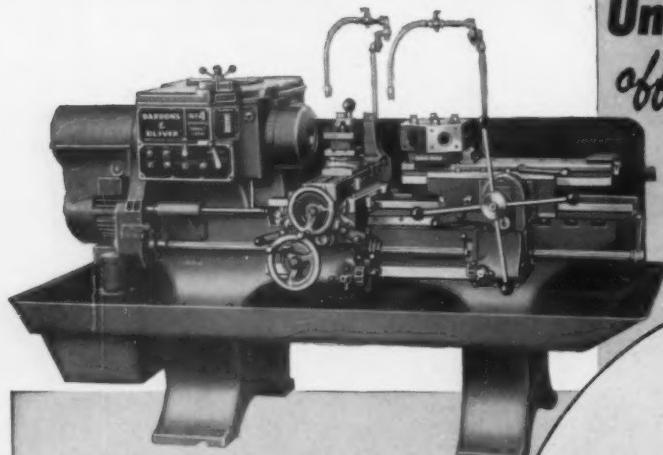
Write for descriptive literature . . . see how

**YOU CAN DO BETTER WITH
B-RIGHT-ON.**

**THE BRIGHTON SCREW
& MANUFACTURING CO.**

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The BARDONS & OLIVER



No. 4

*Universal Turret Lathe
offers these outstanding
HEADSTOCK
Features*

- Sixteen geared spindle speeds, providing a fifty to one speed range
- Optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant horsepower (optional to fifteen) at all spindle speeds
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The complete line of Bardons & Oliver Turret Lathes offers many outstanding features. Write us on your company letterhead for specific model information or send your blue prints for a proposal.

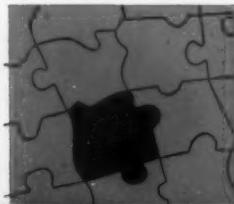
MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, Inc.

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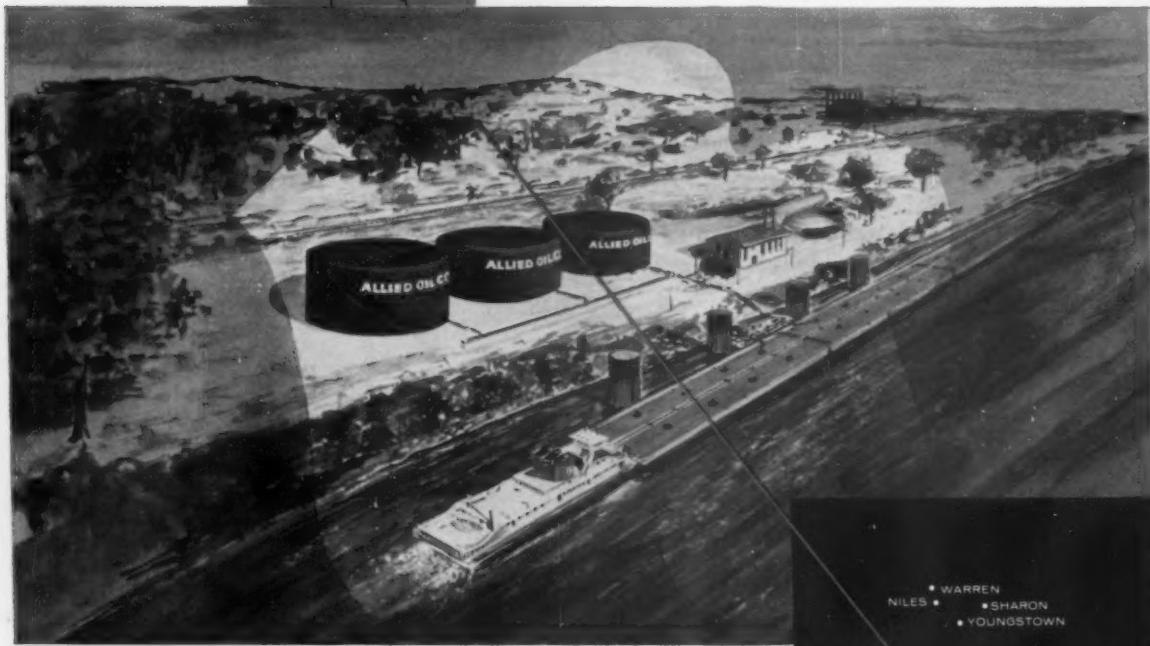
CLEVELAND 13, OHIO

Allied's new Wellsville heavy fuel oil terminal



...THE LATEST PIECE IN THE PATTERN

of Allied's completely
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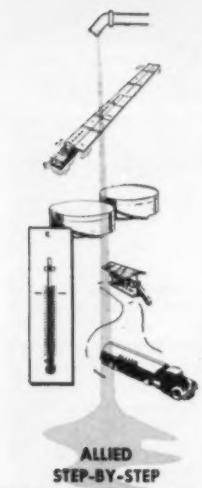


**NEW WELLSVILLE HEAVY FUEL
OIL TERMINAL PROVIDES QUICK,
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• Combining Allied's large volume, low-cost transportation of fuel oil up the Mississippi-Ohio Rivers with short-haul truck transport service to the points of delivery, the new Allied terminal at Wellsville provides heavy fuel oil users with a thoroughly dependable, economical source of fuel oil for their most exacting requirements.

Operating 24 hours a day, the new Wellsville terminal is completely equipped to handle incoming river barge shipments of heavy fuel oil quickly and efficiently — to maintain oil in storage in free-flowing condition — always ready, regardless of weather conditions, for fast, uninterrupted loading at the terminal — and equally important, for quick, easy handling at the storage tanks of fuel oil users.



**ALLIED
STEP-BY-STEP
TEMPERATURE CONTROL**
— keeps heavy fuel oil
free-flowing,
easy to handle . . .
from terminal to users'
storage tanks.

ALLIED OIL COMPANY

A DIVISION OF ASHLAND OIL & REFINING CO.

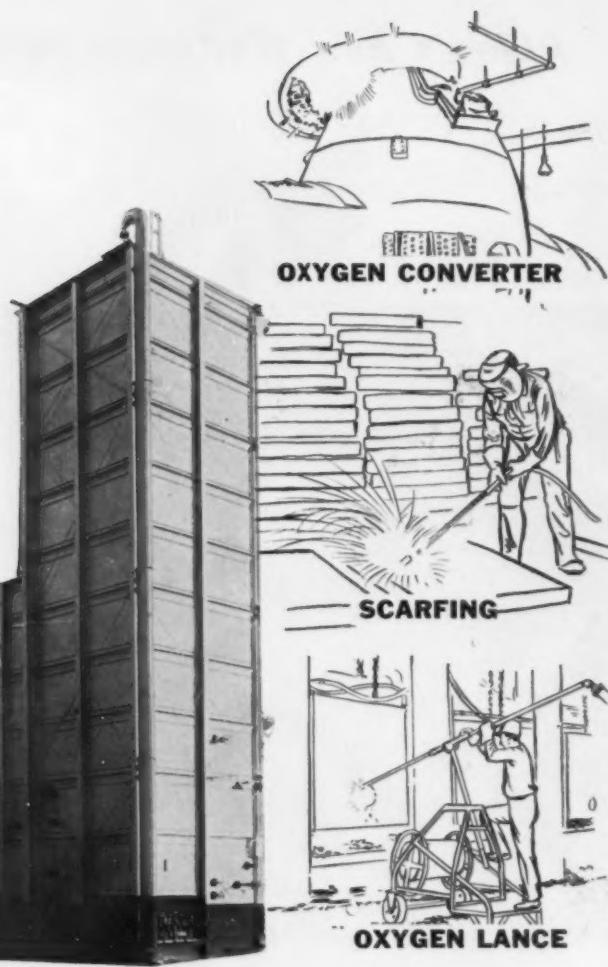
1700 STANDARD BLDG. • CLEVELAND 13, OHIO



BLAST ENRICHMENT



FUEL ENRICHMENT



ON-LOCATION OXYGEN GENERATORS

are an economic necessity in modern steel-making

Modern steel-making, of course, means "oxygen steel-making". Those steel companies that exploit this new technology to its fullest possibilities are the ones that will pay the biggest dividends.

Fuel enrichment in blast furnace and open hearth, the new oxygen converter, the oxygen lance, scarfing, scrap preparation and—perhaps soon—the desiliconizer, all require oxygen in such huge quantities as to make the use of on-

location or "captive" generators an economic necessity. Our experience in providing these units for Weirton, Granite City, Jones and Laughlin and other prominent steel companies proves this point.

Air Products will install, on a lease basis without capital investment by you, if desired, an oxygen and/or nitrogen generating station to meet your particular requirements. We design and

manufacture:

Large capacity tonnage generators for unlimited quantities of oxygen and nitrogen regardless of size, purity or cycle and "Packaged" High-Purity Generators, producing high-purity oxygen and nitrogen separately or simultaneously.

Ask us to investigate your requirements and provide you with a close estimate of the savings you can expect with your on-location generators.

OUTPUT DEVELOPS EXPERIENCE—Air Products has built more than 800 successful gas separation plants.

LOW-COST OXYGEN...NITROGEN

Air Products
INCORPORATED

Dept. I, Box 528, Allentown, Pennsylvania



THIS is a Metal Cleaning and Rust Proofing Machine

... it is part of a Complete Mahon Self-Housed Finishing System
Installed in 1939 on the Roof of Maytag's Plant No. 1



Conventional Wringer Washer
Produced by Maytag in 1939.



Today's Product: The Famous Maytag Wringer Washer Produced Today Receives its Fine, Durable Finish in the Same Finishing Equipment.



... OVER 5,000,000

MAYTAG Conventional WRINGER WASHERS
have PASSED THROUGH THIS FINISHING
SYSTEM ... and It is STILL in DAILY USE!

When you hear this statement: "Mahon equipment is engineered better and built better for more economical operation over a longer period of time", it is no idle boast. There are dozens of Mahon Finishing Systems in various industries throughout the country with performance records comparable to this one at Maytag. When you make a capital investment in equipment which so directly affects your production costs and the appearance and saleability of your product, your primary concern should be end results—quality of finish produced, operating efficiency, flexibility of equipment to handle future production loads and model changes, and yearly maintenance requirements—these are the all-important considerations. The lowest price tag doesn't tell the whole story . . . so, if you want good finishing equipment—equipment that is thoroughly engineered and coordinated to do a good finishing job, remember that you can only buy Mahon experience, Mahon engineering and Mahon quality equipment from Mahon. It may cost a little more, but Mahon customers will tell you that "It's the best investment you can make". See Sweet's Plant Engineering File for information, or write for Catalog A-657.

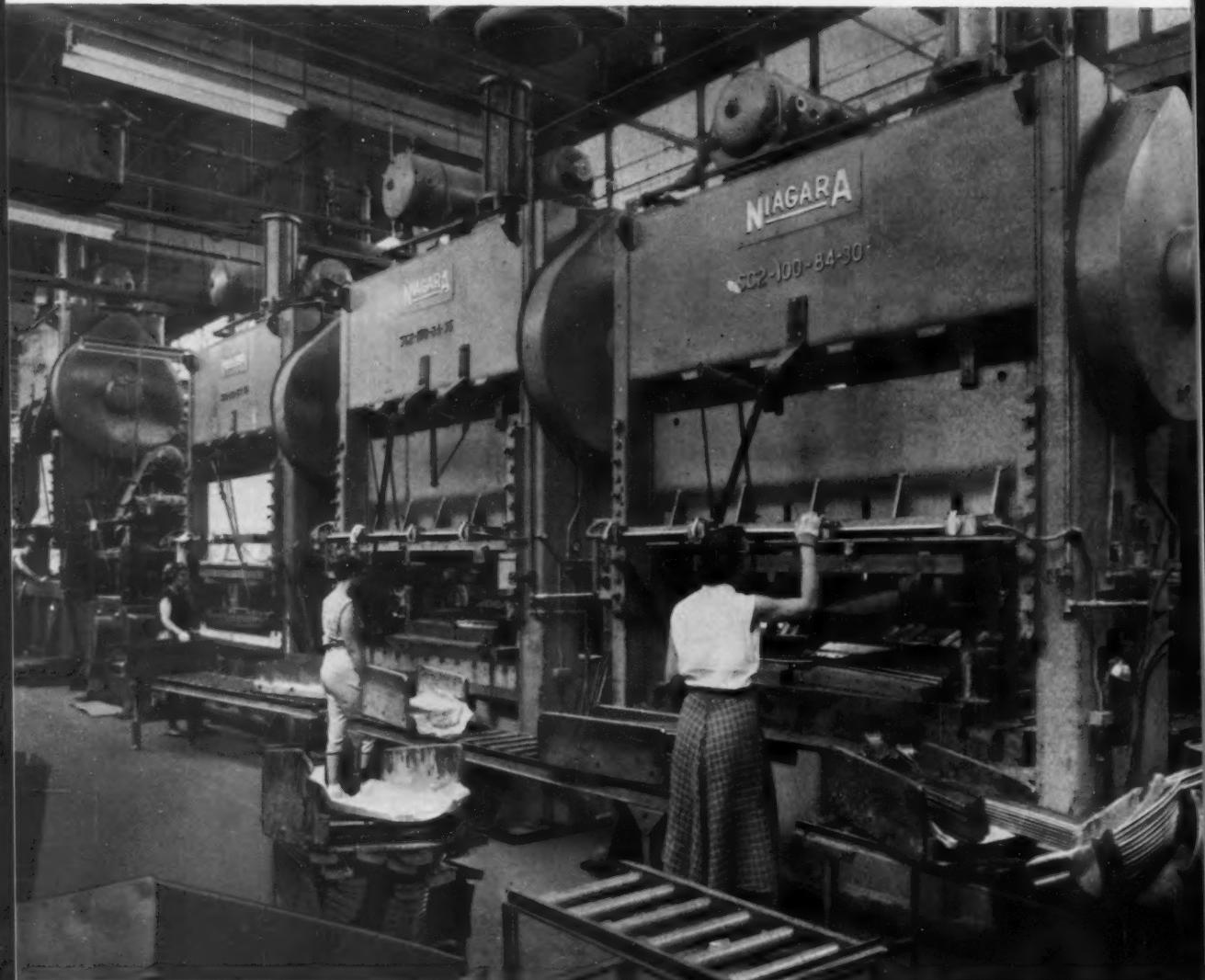
THE R. C. MAHON COMPANY • Detroit 34, Michigan
SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

Partial View of Maytag's Plant No. 1. The Mahon Self-Housed Finishing System Installed on the Roof in 1939 is clearly visible. Over a dozen other Mahon Installations—including Two More Complete Finishing Systems—are today in operation in Maytag Plants.

MAHON

"we concentrate on Niagara"



NIAGARA

DOUBLE CRANK STRAIGHT

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work



presses...

In-line operation of four Niagara Series SC-2 Presses, engaged in progressive production of automotive side moldings from .025" #430 stainless steel.

Press operator shows a blank and formed molding which will grace one of the "Big Three" cars.



SIDE PRESSES

...they require a minimum of maintenance"

Producing up to 1,750,000 automotive moldings per month, these four Niagara Double Crank Straight Side Presses do the work of eight for a large Midwestern metal stamping firm. Their long beds enable the outfitting of each press with two sets of dies for two separate operations.

"We believe in standardizing. That is why we concentrate on Niagara Presses. They require a minimum of maintenance. When jobs come in, we are sure we can get them out. They are a volume machine," says the vice president and plant superintendent.

. . . and with good reasons, this famed line of Niagara presses requires a minimum of maintenance:

- *Rugged, integral, all-welded steel frames of exclusive triple box section design properly resist deflection to assure greater accuracy and longer die life.*
- *Laminated non-metallic ways of box type welded steel slides are a positive safeguard against scoring and assure trouble-free service.*
- *Low inertia pneumatic friction clutch reduces heat and wear. Only the shaft and driving plate are started and stopped at each cycle. Most of the clutch weight continues to rotate with the flywheel.*
- *Outboard mounting of clutch makes it accessible for easy maintenance . . . without disturbing any drive or crown parts.*
- *No adjustment for wear of clutch plate is necessary. It is self-compensating.*
- *Clutch linings are cycle-welded to plate, without rivets, increasing effective life.*
- *Brake shoes are full floating and self-aligning . . . cannot cock, bind or wear unevenly.*
- *Steel gears run in totally enclosed oil baths. Centralized pressure lubrication sends vital oil to journals, ways and wherever necessary for long efficient, service life.*

Like this well known metal fabricator, it will be profitable for you, also, to consider standardizing on Niagara presses. First of all, Niagara has the most to offer . . . straight side double crank, single crank and eccentric geared, open back inclinables and dozens of others. Secondly, in the words of the same company's purchasing agent: "The prices on Niagara Presses are right . . . and they do the job."

Built in 50 through 400-ton capacities, Niagara Double Crank Straight Side Presses are readily equipped with automatic feeds, variable speed drives, iron hands and other automatic materials handling devices so popular with the automotive and appliance industries. Post yourself on this important line by requesting Bulletin 64.



NIAGARA MACHINE & TOOL WORKS

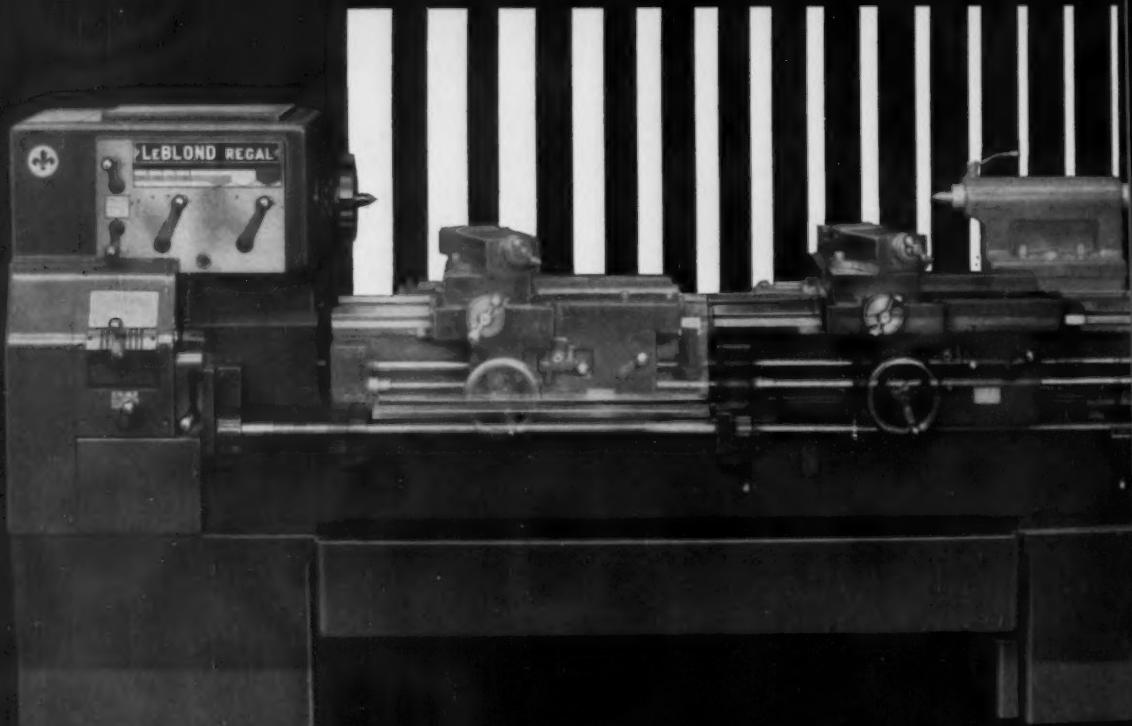
DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

Capacity on a sliding scale

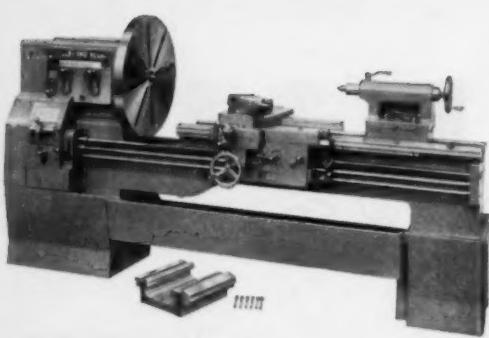
New LeBlond Sliding Bed Gap



Also available . . .
New Plain Gap Regal

Greatly increased swing size to accommodate work with flanges up to 35 inches in diameter. Also performs all normal lathe operations, including close-to-the-face-plate facing.

Regal



With the LeBlond Sliding Bed Gap lathe you break out of "small lathe" limitations—enjoy added capacity and versatility normally available only in much larger, more expensive lathes. On the Regal 17"/28" SBG, the upper bed slides away from the headstock, quickly converting a 17" lathe to a 28". Up to 35 inches of swing is provided for work with large flanges or eccentric projections. Center distance increased over 50% with the bed extended.

For the maintenance or job shop encountering work-pieces of widely varied size and shape, the Regal Sliding Bed Gap lathe offers the ideal, low-cost answer.

Regal performance matches its increased capacity, too. The new 12-speed, gear-belt headstock with its 3-bearing spindle delivers power with precision. The extra wide carriage bridge, riding on hardened and ground steel bed ways, gives staunch tool support. 56 speeds or threads can be selected with the foolproof, self-lubricating quick-change box. Separate feed rod and leadscrew guarantee continued thread chasing accuracy.

Regal Sliding Bed Lathes can give you the double advantage of a regular engine lathe *plus* a special purpose machine tool. Also available in 19"/28" size. Put them to work for you. See your LeBlond Distributor or write.

... cut with confidence



THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

*World's Largest Builder of a Complete Line of Lathes
for More than 70 Years*



SPECIALLY DESIGNED
solve a problem,



Corrugated steel construction of these units provides strength, assures long service life. Special channel construction under boxes permits free movement of casters, yet allows four-way entry for lifting and storing.

R E P U B L I C



World's Widest Range of Standard Steels

REPUBLIC BOXES

speed handling

...save space

Today's modern high-speed machines may meet the demand for increased production. But they can also create problems.

This was the case at the Crown & Closure Division of Crown Cork and Seal Company, Inc., Baltimore, Maryland, world's largest maker of metal closures for glass containers.

Their problem was the handling, moving and storing of the tremendous daily output of a battery of screw cap machines. Some of the machines turn out as many as 100,000 screw cap shells per hour. A handling unit was required that could be used to rapidly move the semi-finished caps from the machines to a final manufacturing operation located on another floor—or to a storage area for future use.

Republic Materials Handling Engineers were invited to work on the problem with Crown Cork Engineers. The solution was the design and fabrication by Republic's Pressed Steel Division of the special box-type trucks shown at left.

Equipped with casters, the boxes can be moved easily by hand. A time-saving feature is a hinged door which opens when the box is tilted forward. This permits the caps to slide out and down a chute to the floor below where final manufacturing is completed. The entire handling operation is simplified and speeded. Storage space is conserved.

This is another example of customer service from Republic—another example of experience and versatility in solving a materials handling problem. Perhaps you would like to talk over your handling problems with a Republic Engineer. There's no obligation. Simply contact the nearest Republic Materials Handling Equipment Representative. Or send us the coupon.



SPEED HANDLING of heavy materials, like bar stock, with Republic Chain Slings, Attachments and Accessories. All Republic Chain Slings are proof tested and warranted to meet or exceed specifications. They provide an exceptionally high degree of safety. Republic's Bolt and Chain Division makes chain slings in Alloy Steel, High Test Steel and Wrought Iron. Republic chain engineers are always available to help you select the proper chain for your particular requirements.



SOLVE THE PROBLEM of storing heavy items with Republic Wedge-Lock Steel Shelving. It is specifically designed for high stacking of enormous weights. As more weight is added joints actually get tighter. Wedge-Lock Steel Shelving provides maximum loading in minimum floor space. It is completely flexible to meet changing space requirements. It can be assembled quickly and easily. Send coupon for full information.

REPUBLIC STEEL CORPORATION

Dept. C-218

3104 East 45th Street

Cleveland 27, Ohio

- Send more information on Materials Handling Equipment.
 - Have a Materials Handling Engineer call.

Send additional information on:

 - Chain Slings
 - Wedge-Lock Steel Shelving

Name _____ Title _____

Company—

Address _____

City _____ **Zone** _____ **State** _____

STEEL

and Steel Products

How Morse Distributor critical indexing problem

H. C. Smith Oil Tool Company increased production one-third, reduced labor cost 30%—another example of how Morse Distributors serve industry.

When the H. C. Smith Oil Tool Company, of Los Angeles, faced a precision indexing problem in machining gear-type oil drill bits, they called a Morse Distributor.

Harold Kimmel, sales engineer for J. W. Minder Chain and Gear Company, analyzed the operation. He specified Morse MC 6000 Cam Clutches to provide an in-

finitely accurate feed for the milling process. Result: an increase of end milling machines from two to three cutting units, at a labor costsaving of 30%.

Read the picture story, and see why you can rely on Morse Distributor engineering service and complete stocks for fast answers to your power transmission problems.



"The Morse MC 6000 Cam Clutch was the ideal solution to the precision indexing problem in this high-speed milling operation," says Harold Kimmel, sales engineer for the J. W. Minder Chain and Gear Company. It is accurate up to 1/10,000 of an inch.

engineering service solved in milling operation



R. E. Goetz (center), manufacturing engineering supervisor, and H. E. Kidder, factory manager of H. C. Smith Oil Tool Company, outline problem to Harold Kimmel. Slight indexing errors are cumulative in milling gear-type cutters shown.



Kimmel gets on-the-spot information while watching Milling Foreman Lloyd Fage run high-speed, two-flute end mill. He notes that present differential transmission and worm gear indexing systems are inaccurate and slow down production.



Kimmel and stock clerk select an MC 6000 Cam Clutch right off the shelf. Complete local stocks of Morse products make a big difference on rush power transmission problems.

Morse Distributors can help you

Call in your local Morse Distributor when you need power transmission equipment.

- He can give you skilled engineering assistance on all power transmission problems.
- He offers complete stocks of Morse precision-built power transmission equipment, ready for immediate delivery.

Call on your Morse Distributor any time for fast service, quality products, and experienced engineering help. He is only as far from you as the Yellow Pages of your local telephone directory.



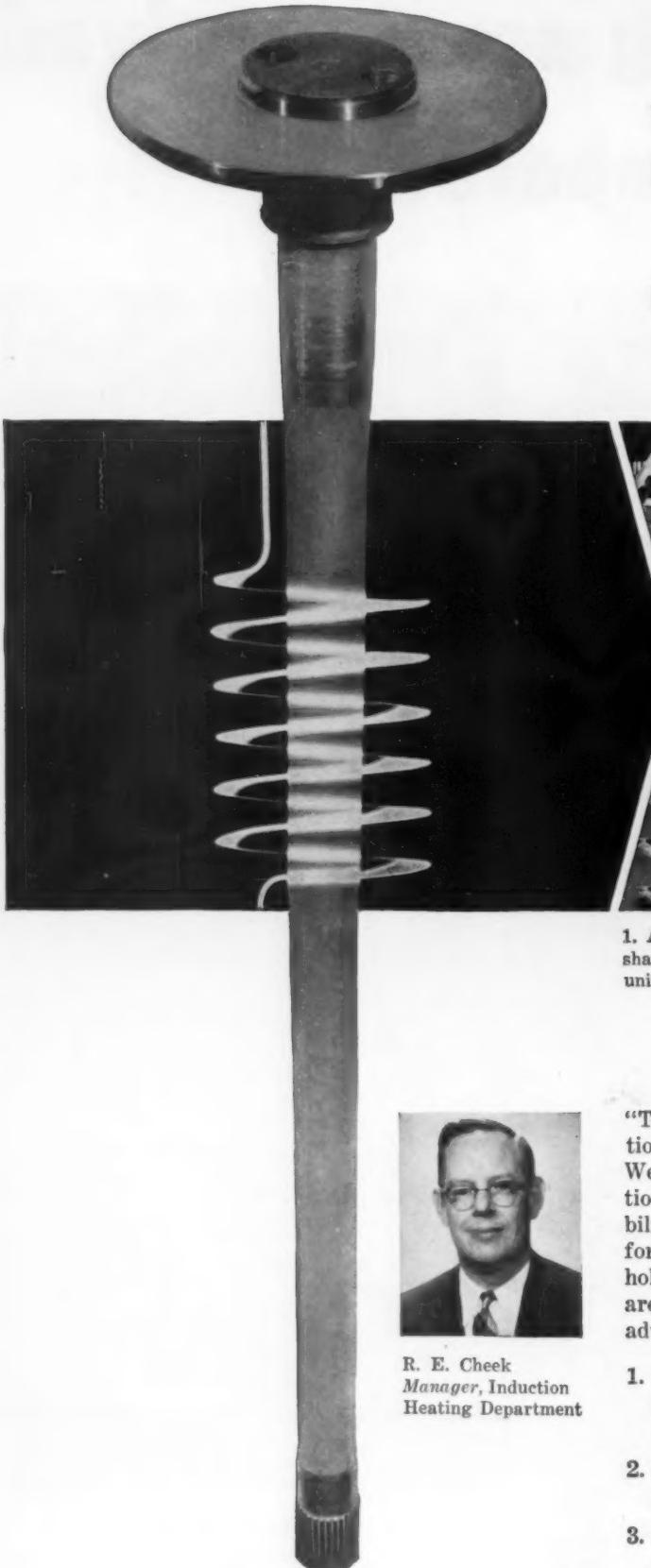
MORSE CHAIN COMPANY
INDUSTRIAL SALES DIVISION
ITHACA, N.Y.

MORSE



POWER TRANSMISSION
PRODUCTS

*Trademark



Westinghouse induction heating

doubles axle

1. A single operator surface-hardens 6 rear-axle shafts at each setup of this Westinghouse induction unit. Production per hour totals 210 shafts.

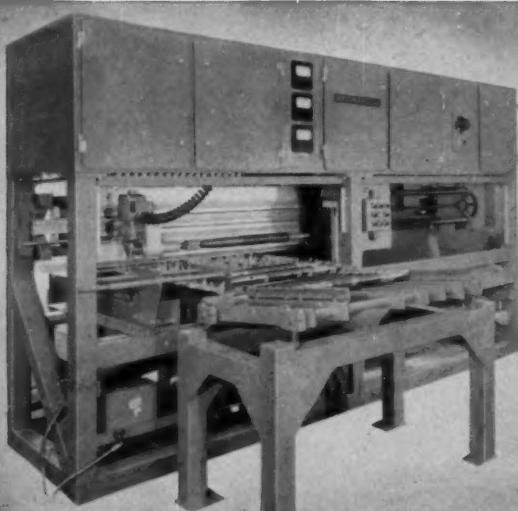


R. E. Cheek
*Manager, Induction
Heating Department*

"Three different axle-hardening applications," reports R. E. Cheek, "show a slice of Westinghouse experience in solving production line heat-treating problems. Dependability of Westinghouse induction equipment, for example, protects production timing and holds maintenance to a minimum. Results are measured, too, in three important profit advantages."

1. Twice the axle fatigue life is obtained from lower cost, plain carbon steels. No more need for costlier alloys.
2. Lower carbon steels lengthen tool life . . . reduce machining and replacement costs.
3. Axle shaft distortion is minimized by rapid induction heating and quenching.

fatigue strength . . . lowers cost



2. As many as 33 axle shafts up to 42 inches long and weighing up to 100 lbs. are surface-hardened by this Westinghouse induction equipment.



3. Westinghouse general-purpose induction scanner handles shafts up to 30 inches long, 80 lbs. weight, for surface-hardening and quenching.

Many other factors, such as savings in floor space, rapid start-up, and cooler more productive working conditions add to the high efficiency of each installation.

A profit return for you? Westinghouse induction - heating experience can show you production problems turned into profitable solutions for hardening, annealing, joining, or forging. Why not call on your local Westinghouse industrial heating sales engineer? He'll bring you expert problem solving and complete service. Westinghouse Electric Corporation, Industrial Heating Division, Meadville, Penna.

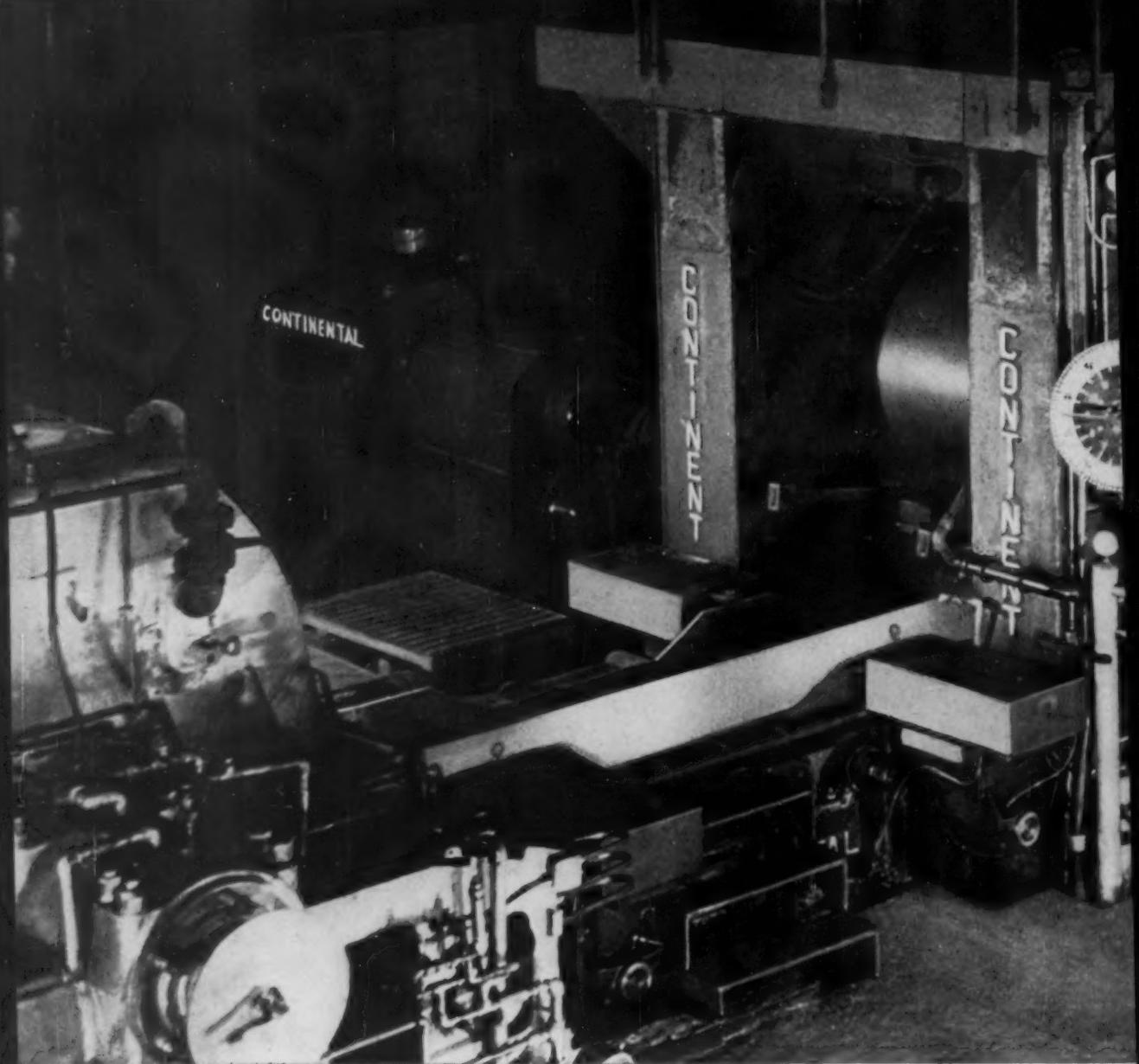
J-10455-X

The Westinghouse Heat-Treating Family

GAS • ELECTRIC • INDUCTION

**WATCH
WESTINGHOUSE!**

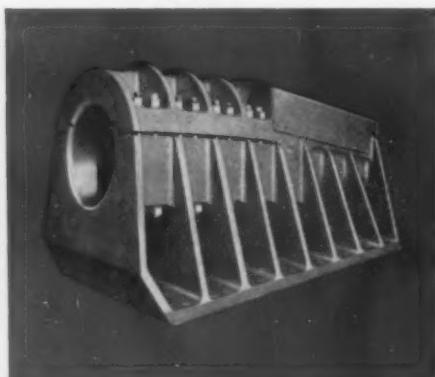
**WHERE BIG THINGS
ARE HAPPENING FOR YOU!**



CONTINENTAL 26" x 49" x 66", 4-high reversing hot strip mill
in the Newport Steel Corporation Plant, Newport, Kentucky.



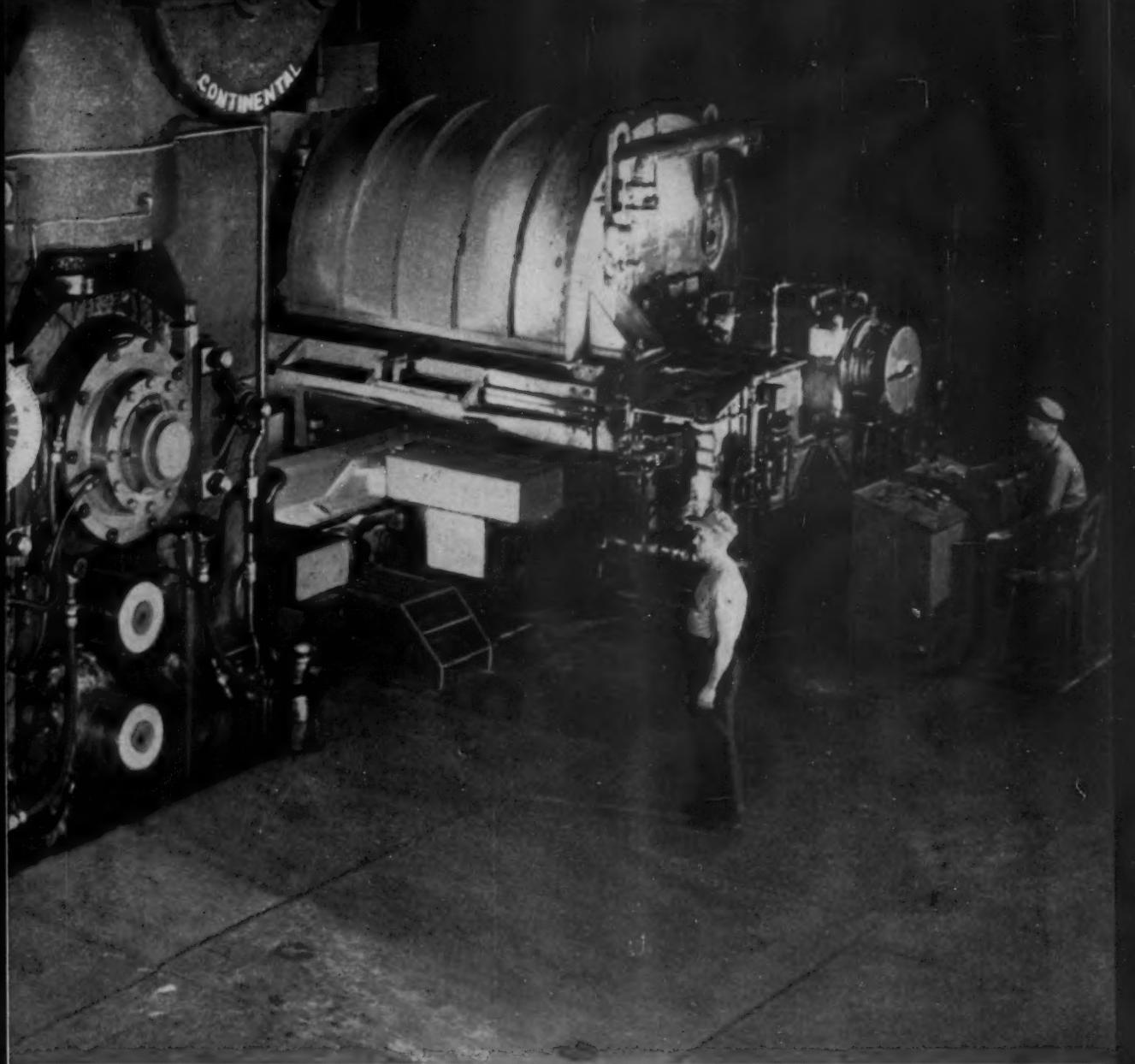
ROLLS—Iron, alloy iron and steel rolls for all types of rolling mills.



CASTINGS—carbon and alloy steel castings from 20 to 250,000 pounds.



WELDMENTS—fabricated steel plate, or cast-weld design.



BLAW-KNOX makes what it takes
to roll precision-gage hot strip directly from ingots

Precision-gage hot strip is rolled directly from ingots by this modern CONTINENTAL 66-inch 4-high reversing hot strip mill in the Newport Steel Plant at Newport, Kentucky.

A full range of gages and analyses, including carbon and special grades of steel, are rolled by this 26" x 49" x 66" mill. The mill was designed to incorporate an existing 4000 hp. d.c. reversing motor through a pinion stand.

Blaw-Knox designs and builds complete rolling mill installations—assumes un-

divided responsibility from preliminary engineering to satisfactory operation. At any time we'll be glad to discuss your plans with you.

BLAW-KNOX COMPANY

Foundry and Mill Machinery Division

Blaw-Knox Building • 300 Sixth Avenue
Pittsburgh 22, Pennsylvania

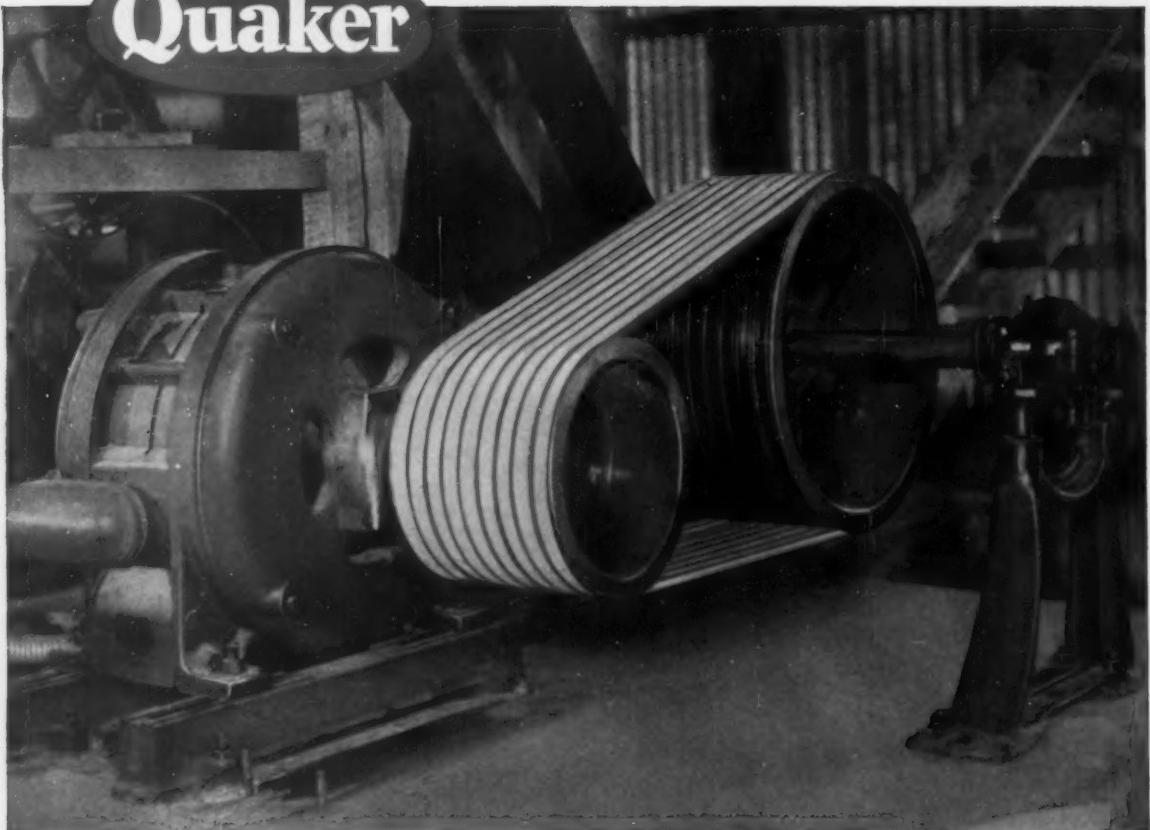
Complete Rolling Mill Installations . . . including all auxiliary equipment . . . for ferrous and non-ferrous metals

Hot strip mills • cold strip mills • slabbing mills • temper mills • universal mills • plate mills • blooming mills • structural mills • roll mills • billet mills • rod mills • merchant mills • roll lathes • chippers • special machinery • and complete auxiliary equipment.

50th Anniversary



Quaker



**Low stretch, high flexing
stands up to shock impacts**

Cut down buying costs. Order all your rubber product needs from a single source — your Quaker-Quaker Pioneer distributor. He's as near as your phone — and ready to serve you. Write for free brochure and name of nearest distributor.

Strong and tough for large heavy duty multiple pulley drives, this V-belt gives long trouble-free performance where shock loads are encountered. Made of high tensile rayon cord, pre-stretched by exclusive heat stretching process. High traction jacket encloses multiple layers of rayon embedded in premium cushion rolls. All Quaker-Quaker Pioneer multiple V-belts are perfectly matched, assuring that each belt carries full share of load. Our complete line of industrial rubber products also includes hose, packing and moulded rubber for every use.

H. K. PORTER COMPANY, INC.

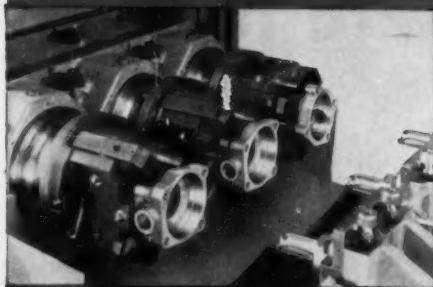
HKP

QUAKER RUBBER DIVISION

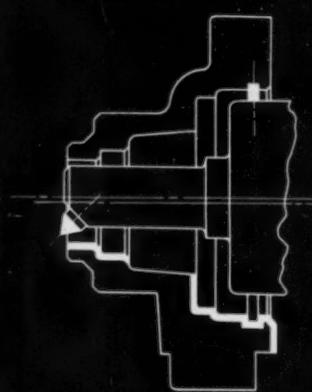
Philadelphia 24, Pa.

QUAKER PIONEER RUBBER DIVISION

Pittsburg, Calif.



Showing parts mounted in the chuck.
Without chuck changes, any of three
parts having different exterior forms
but identical interior contours can be
accommodated.



12 operations are performed in one
machine cycle. Heavy lines denote
surfaces machined.

Intricate contouring is fast, accurate—

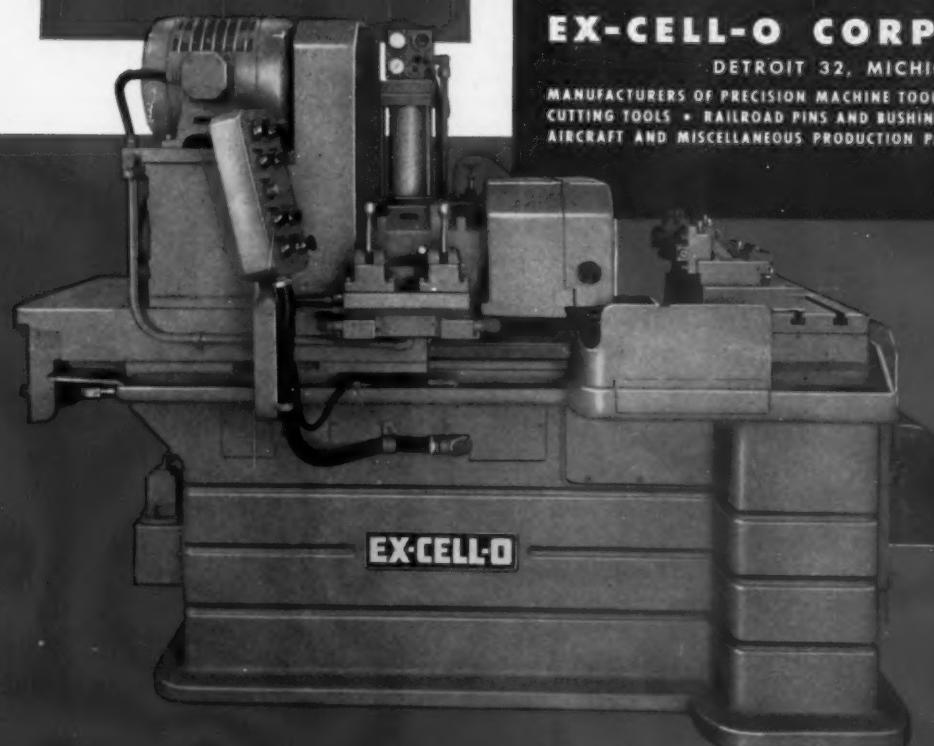
12 operations in one cycle!

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with accuracy, versatility and speed in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

Cams can be changed in minutes. Cam assembly swings out for quick, easy change. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base. Contact your Ex-Cell-O representative or write direct for complete information.



EX-CELL-O CORPORATION

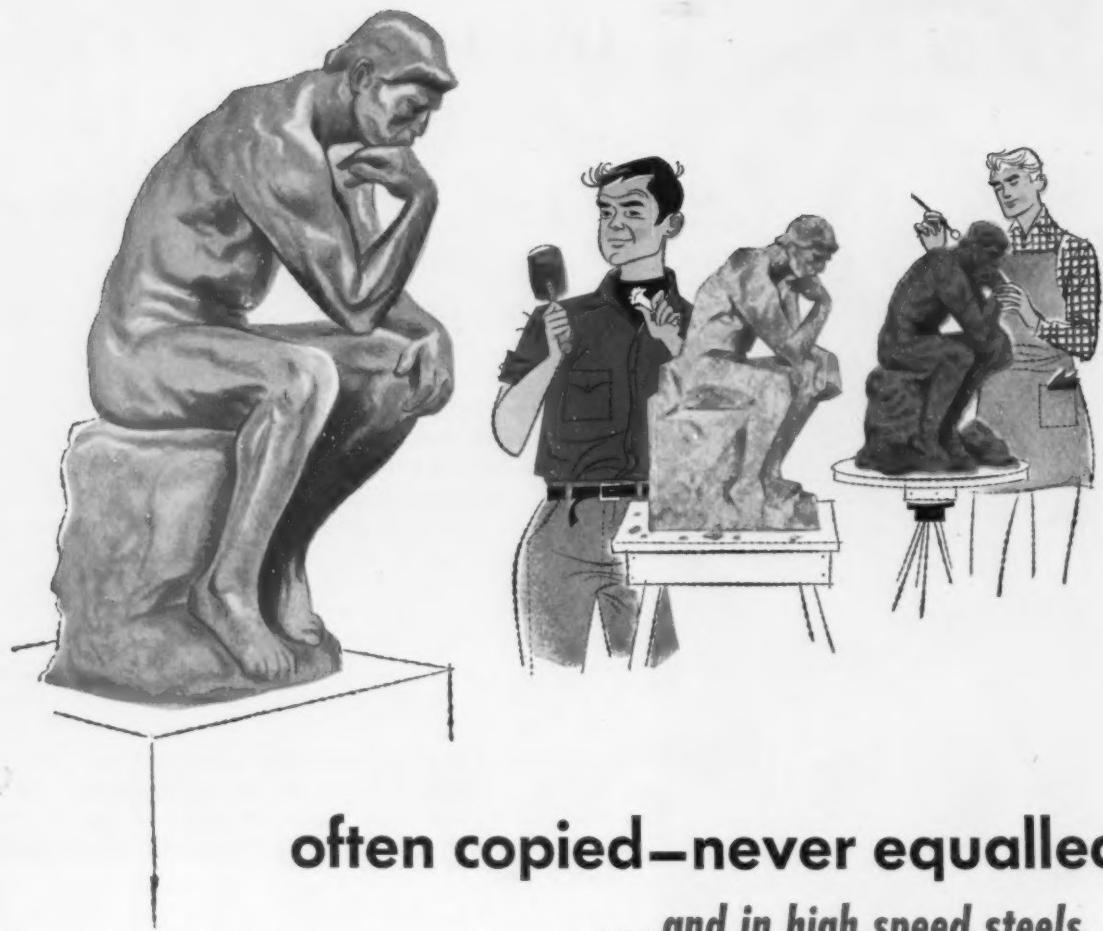
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-52



At left: The Ex-Cell-O Styled 312 Cam Operated Precision Boring Machine. A smaller model, the Ex-Cell-O Style 308, is also available because of the demand for this type of machine.



often copied—never equalled
*... and in high speed steels,
 nothing has ever equalled REX*

Crucible's REX® high speed steel is in a class by itself — has been for more than half a century. And it gets better every year. New improvements in manufacturing techniques have brought even greater uniformity and quality to its well-known properties.

But prove this for yourself—shop-test the new REX in your own plant. Check its structure, uniformity, response to heat-treatment—all-around tool performance. Try REX any way you like—you'll see for yourself why the new REX is still the *standard for comparison* in every high speed steel application.

You can get REX from stock from your nearby Crucible warehouse—or promptly by direct mill delivery. For further information on REX and the many other Crucible special purpose steels, send for the *Crucible Publication Catalog*—it's yours for the asking. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE

first name in special purpose steels

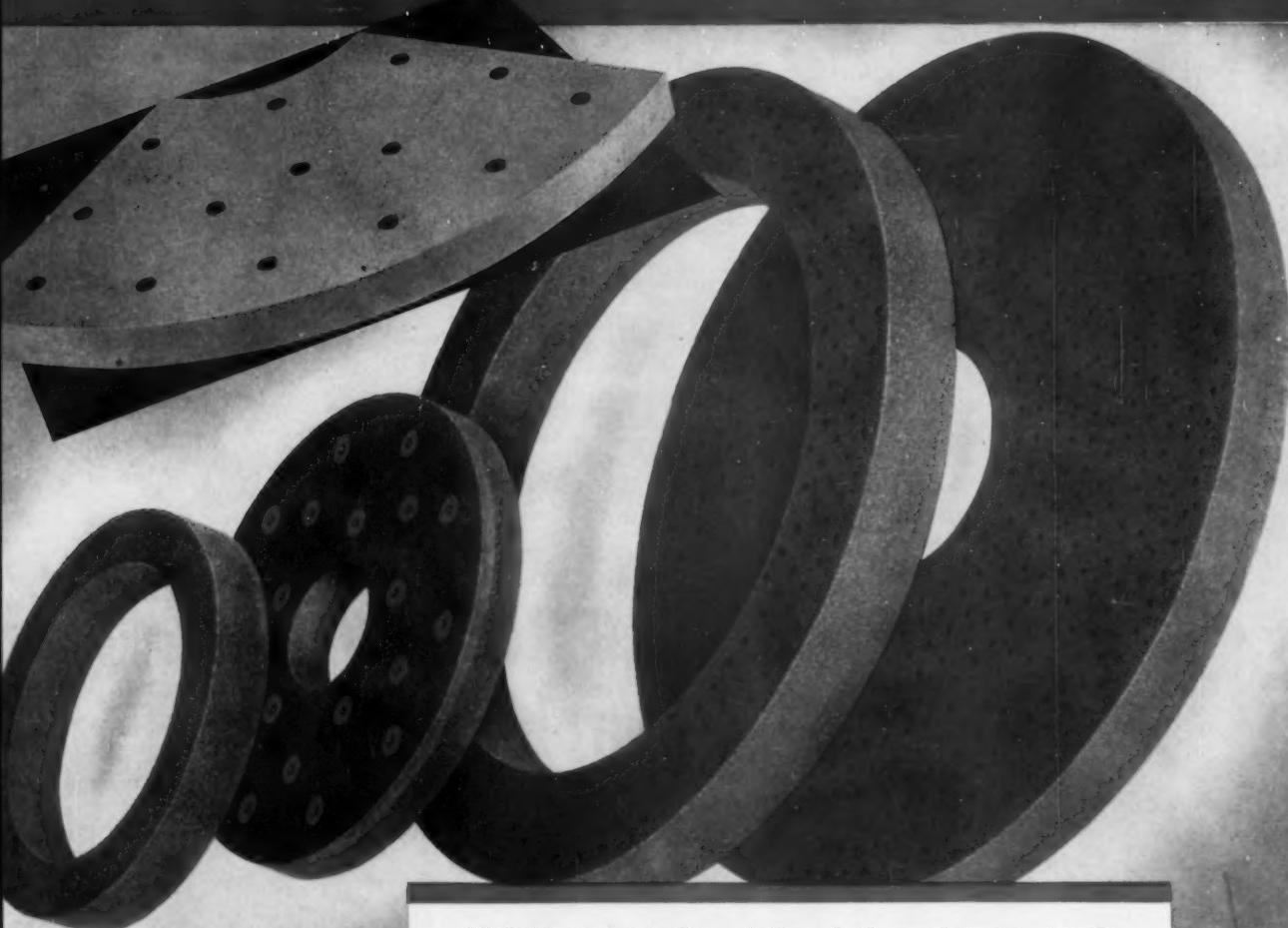
Crucible Steel Company of America

SIMONDS
ABRASIVE CO.

Nut or bolt inserted

ABRASIVE DISCS

for faster production



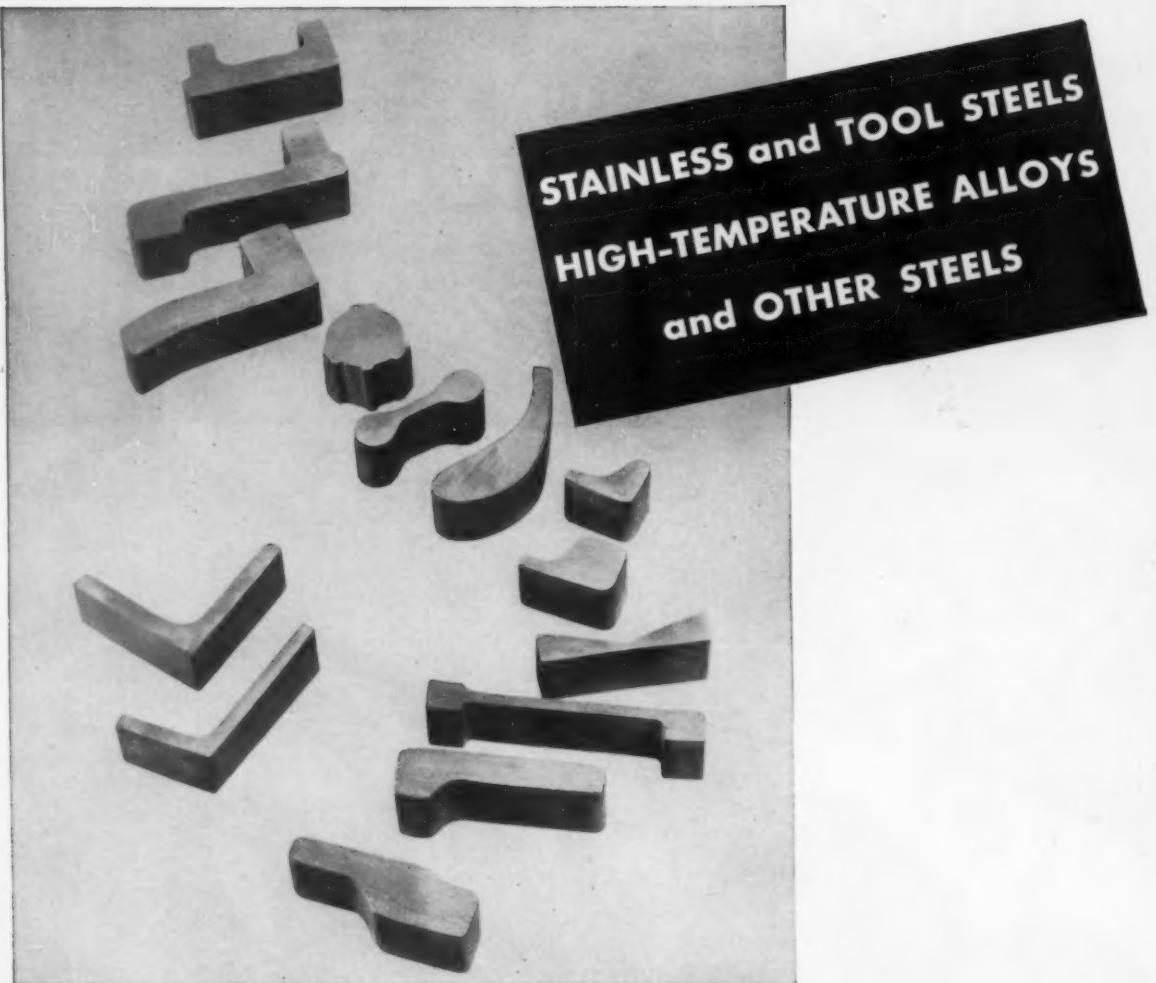
Made by an outstanding grinding wheel manufacturer expressly for use on Besly, Gardner, Hanchett and similar grinders . . . furnished in grain and grade specifications specially engineered to give better, faster production . . . available in all sizes to fit all grinders, back plates and bolt hole layouts . . . supplied plain or perforated, solid or sectional, for use singly or in pairs. Only usable abrasive charged for. Send for Bulletin ESA 54.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

**CALL YOUR SIMONDS
DISTRIBUTOR**





A-L HOT EXTRUSIONS (solid and hollow) may solve problems for you



Help!

(Dept. A-831)

We have a parts problem that hot extrusions might solve. Let's see an AL representative for facts and figures.

- STAINLESS STEEL
- TOOL STEEL
- HIGH TEMPERATURE STEEL
- OTHER STEELS

Name _____

Company _____

Address _____

Where can these leading advantages of hot-extruded special alloy steels apply to your production?

1. Hot extrusions require very little finishing before use, even in the case of involved shapes. The scrap loss is small and you can buy raw materials closer to finish size. You buy less high-cost steel, cut away less of it . . . save both in time and material cost.

2. The range of shapes, solid or hollow, which can be hot-extruded is almost infinite. They can be easily and quickly produced in any quantity. Dies for new or experimental parts cost little and can be made up fast.

• We're ready to serve your needs with hot extrusions in any grade of stainless or high temperature steel, many tool steel grades and other steels. Call us in to help. *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

Leading Producer-High Alloy Steels
Allegheny Ludlum

WAD 8310

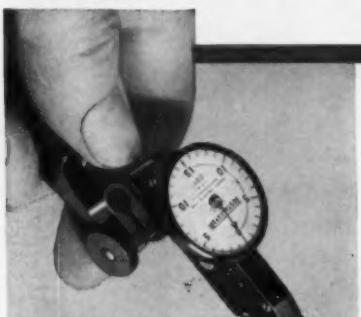


The World's Most Imitated

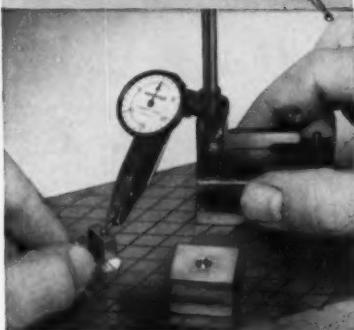
FEDERAL

TESTMASTER

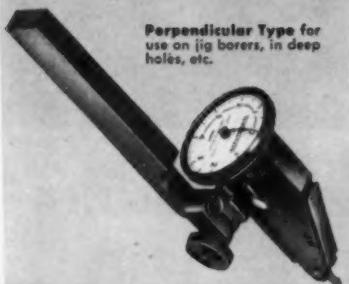
TRADE MADE SEC. U. S. PAT. OFF.



Regular Type — Adaptable to all tool posts, height and surface gages, etc.



Perpendicular Type for use on jig borers, in deep holes, etc.



Copied in Foreign Countries and by nearly a dozen companies in the United States, it still offers more than any other!

The **Federal Testmaster**, though extensively imitated, has never been equalled.

The crown gear movement which is original with these Indicators makes it possible to build-in the exceptionally high accuracy and sensitivity which are so valuable to users. Two different gear ratios are used — one for each model, graduated in .001" (Model 1) and .0001" (Model 2).

Contact pressure is extremely light. Contact points are ratchet-held for positive positioning.

The Testmaster is simple to use, without complicated adapters that are not only cumbersome but also cause inaccuracies due to friction, lost motion and inertia. Ruggedly built for production inspection and exceptionally adaptable to the many tests required in general machine shop and tool room operations, the Testmaster has a thousand uses. Ask for illustrated bulletin.

FEDERAL PRODUCTS CORPORATION
61311 Eddy Street • Providence 1, R. I.



Non-Magnetic Type for use on magnetic chucks, parallels and other magnetic fixtures.



Crown Gear Movement. Reduces friction and inertia to a minimum insuring great accuracy. Gear teeth hobbed for accuracy.



Jewel Bearings — Vital bearings are jeweled to reduce friction and insure continued accuracy.



Index Point. Interchangeable. Ratchet design permits hard Chrome Plated Point to be reversed or set positively at any angle within 180° arc.



Dovetail Slides and Universal Clamp make Testmaster easiest to set and insure rigid support in any position. Dial rotates for quick setting.

*Ask **FEDERAL** First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging



SIMPLIFYING HEAT EXCHANGER AND CONDENSER FABRICATION

The ease with which heat exchanger and condenser tubes can be rolled into tube sheets depends, to a certain extent, upon the uniformity of tube wall. One of the controlling factors of wall uniformity in the manufacture of seamless steel tubing is the contour of the piercer point.

Phil Morrison, a piercer point man, is shown at work on one of B&W's seamless tube mills. One of his duties is to examine the piercer point between each tube making operation. By making certain that the point has not been deformed in service—and that takes experience and a practiced eye—he helps to control wall uniformity in the pierced tube. He knows that although hot and cold work after the piercing operation can minimize, it cannot eliminate non-uniformity of wall section.

Phil's attention to detail, teamed with specially designed piercing equipment, helps to achieve the quality—"ease of rolling-in"—for B&W Heat Exchanger and Condenser Tubes. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels



**What
shape
is a
quality
fastener?**

Here is a handful of ELASTIC STOP® nuts. Each has ESNA's familiar red locking collar . . . is self-locking and vibration-proof. Each is a readily assembled, one-piece unit. Each provides positive protection against thread corrosion . . . prevents liquid seepage along bolts. Each is made from the finest of raw materials. Each is exactly controlled as to finished dimensions, class of thread fit and finish. Each is now in use on critical applications, with a record for uniform high quality that is unmatched.

Most of them are standard parts. Some originated as the result of a specific request for ESNA's help with an important fastening problem.

Isn't it logical to call on us with your next fastening problem?

ELASTIC STOP NUT CORPORATION OF AMERICA



Elastic Stop Nut Corporation of America

Dept. N62-117, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

ELASTIC STOP nut bulletin

Here is a drawing of our product.
What self-locking fastener would
you suggest?

Name. _____ Title. _____

Firm. _____

Street. _____

City. _____ Zone. _____ State. _____



SIMPLIFYING HEAT EXCHANGER AND CONDENSER FABRICATION

The ease with which heat exchanger and condenser tubes can be rolled into tube sheets depends, to a certain extent, upon the uniformity of tube wall. One of the controlling factors of wall uniformity in the manufacture of seamless steel tubing is the contour of the piercer point.

Phil Morrison, a piercer point man, is shown at work on one of B&W's seamless tube mills. One of his duties is to examine the piercer point between each tube making operation. By making certain that the point has not been deformed in service—and that takes experience and a practiced eye—he helps to control wall uniformity in the pierced tube. He knows that although hot and cold work after the piercing operation can minimize, it cannot eliminate non-uniformity of wall section.

Phil's attention to detail, teamed with specially designed piercing equipment, helps to achieve the quality—"ease of rolling-in"—for B&W Heat Exchanger and Condenser Tubes. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels

**What
shape
is a
quality
fastener?**



Here is a handful of ELASTIC STOP® nuts. Each has ESNA's familiar red locking collar . . . is self-locking and vibration-proof. Each is a readily assembled, one-piece unit. Each provides positive protection against thread corrosion . . . prevents liquid seepage along bolts. Each is made from the finest of raw materials. Each is exactly controlled as to finished dimensions, class of thread fit and finish. Each is now in use on critical applications, with a record for uniform high quality that is unmatched.

Most of them are standard parts. Some originated as the result of a specific request for ESNA's help with an important fastening problem.

Isn't it logical to call on us with your next fastening problem?

ELASTIC STOP NUT CORPORATION OF AMERICA



Elastic Stop Nut Corporation of America

Dept. N62-117, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

ELASTIC STOP nut bulletin

Here is a drawing of our product.
What self-locking fastener would
you suggest?

Name _____

Title _____

Firm _____

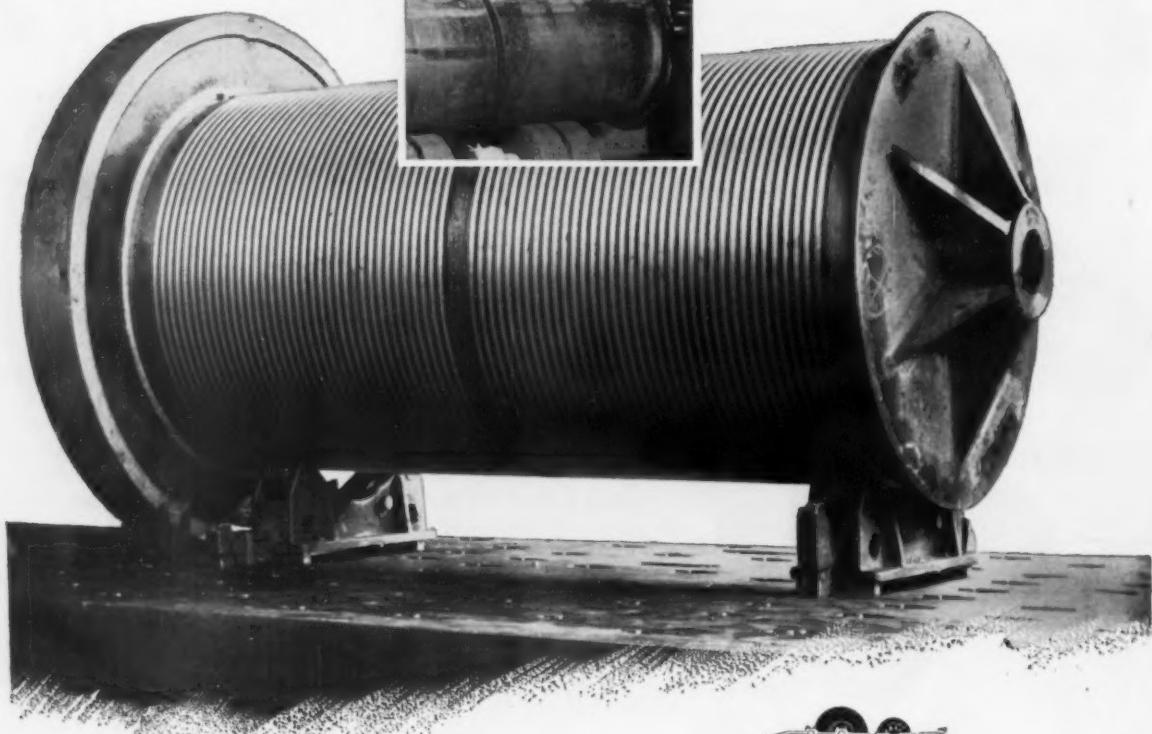
Street _____

City _____

Zone _____ State _____

Here's a drum that can't be beat!

Automatic welding speeds up to 120" per minute are achieved on Morgan's continuous welder. Perfect welding penetration assures uniform, strong welds.



- Fabricated drums in Morgan cranes are structurally stronger than cast drums . . . yet they weigh less.

Automatic welding of Morgan drums with the world's largest continuous welding machine assures uniform, sound joints and seams.

Crane girders, too, are welded automatically, making them stronger and lighter. Morgan welders are qualified in accordance with A.S.M.E. and A.W.S. codes.

Performance records prove conclusively that Morgan cranes are the best in the business . . . cost less to operate and maintain. Let our representative show you how to save the most by buying the best . . . Morgan!

The Morgan Engineering Company, founded in 1868, manufactures overhead electric traveling cranes, gantry cranes, open hearth special cranes, plate mills, blooming mills, structural mills, shears, saws, and auxiliary equipment.

THE
MORGAN
ENGINEERING CO. *Alliance, Ohio*

Youngstown "cold heading quality" wire and rods

*... provide high
fastener production
at National Screw
& Manufacturing Co.*

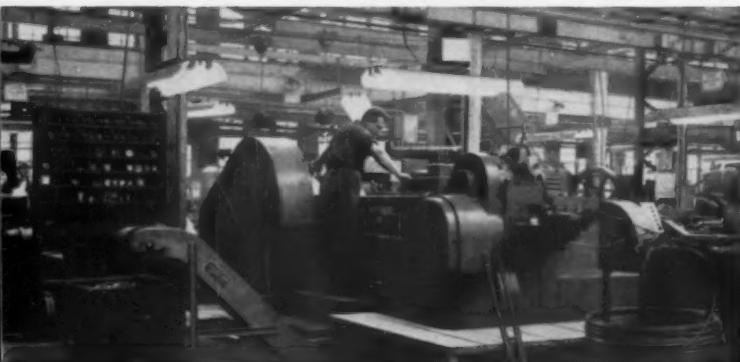
CLEVELAND'S National Screw & Manufacturing Company is widely known for the quality and dependability of their complete line of fasteners. To maintain continuous product quality and provide high production, they rely on Youngstown Cold Heading Quality Wire and Rods as the basic material for many of their fabrication processes.

Youngstown Wire & Rods are internally sound, uniform in both physical structure and chemical composition—as well as free from injurious seams and slivers. That's because they are quality controlled through all Youngstown's integrated operations from ore mining to finish product.

Furthermore, Youngstown's Cold Heading Quality Wire is supplied with a tight "Nogald" or "Extrudo" coating that provides the necessary lubrication to prevent galling and undesirable die wear. It feeds smoothly through cold headers giving steady high production right around the clock. No wonder satisfied users report: "Our production's increasing—Rejects falling—Profits up." Why not make it your specification?

Call or write your nearest Youngstown District Sales Office for additional information on metallurgical assistance.

THIS MODERN SOLID DIE DOUBLE LONG-STROKE COLD HEADING MACHINE AT NATIONAL SCREW PRODUCES HIGH CARBON HEX-HEAD CAP SCREWS UP TO $\frac{1}{2}$ INCH DIAMETER, BY 6 INCHES LONG WITH ONLY TWO STROKES OF ITS HAMMER. USING 2800 POUNDS OF WIRE, IT DELIVERS APPROXIMATELY 4900 PIECES PER HOUR.



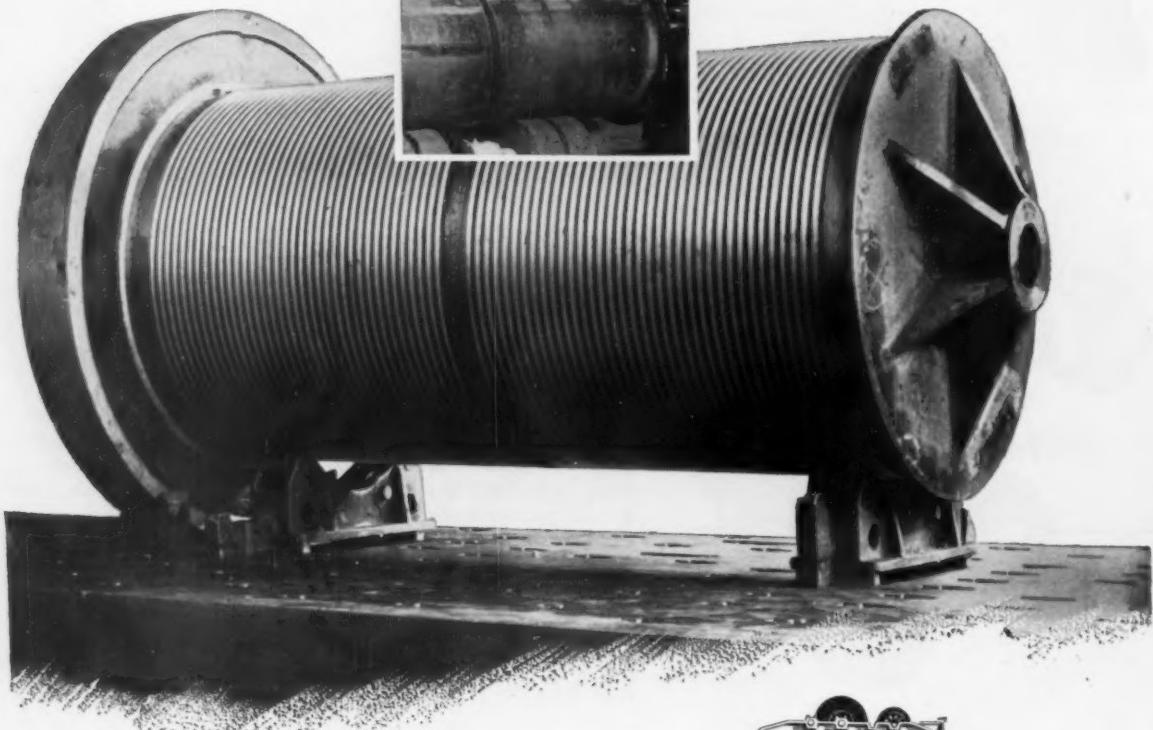
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Tool Steel

General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

Here's a drum that can't be beat!

Automatic welding speeds up to 120" per minute are achieved on Morgan's continuous welder. Perfect welding penetration assures uniform, strong welds.



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Youngstown "cold heading quality" wire and rods

... provide high fastener production at National Screw & Manufacturing Co.

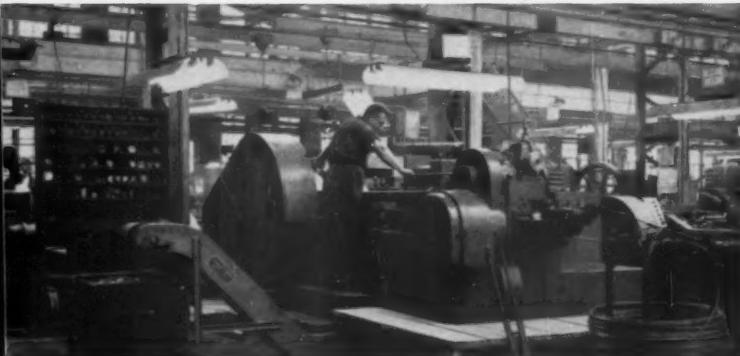
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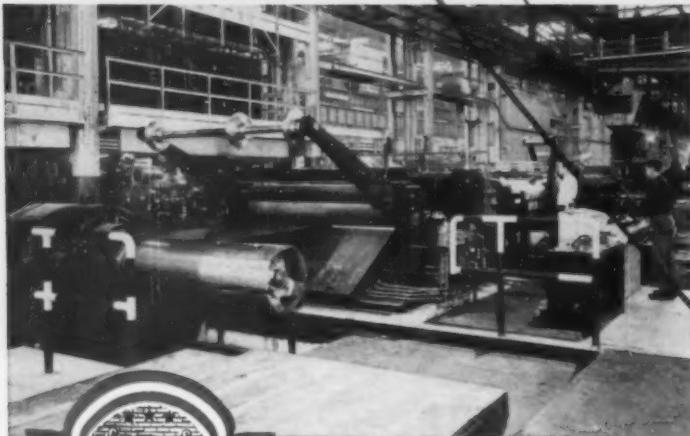
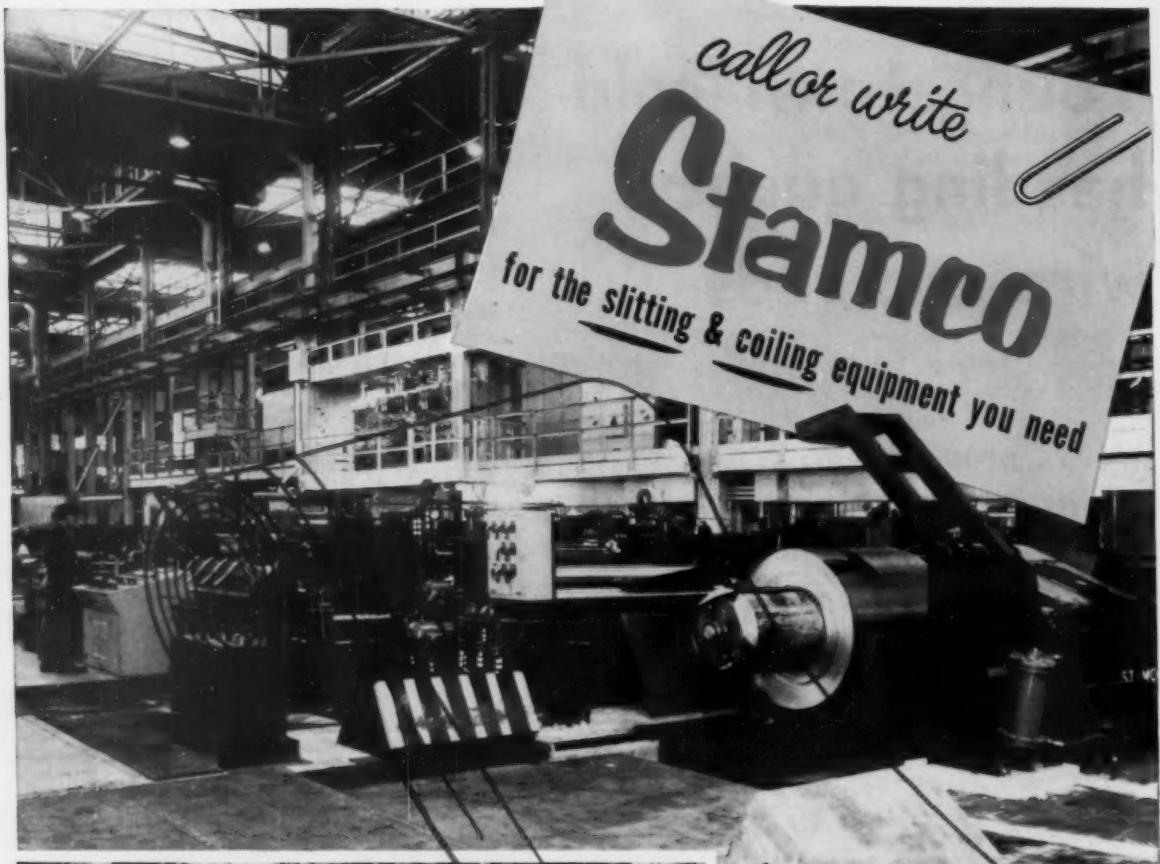


THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

One of the largest slitting & coiling lines



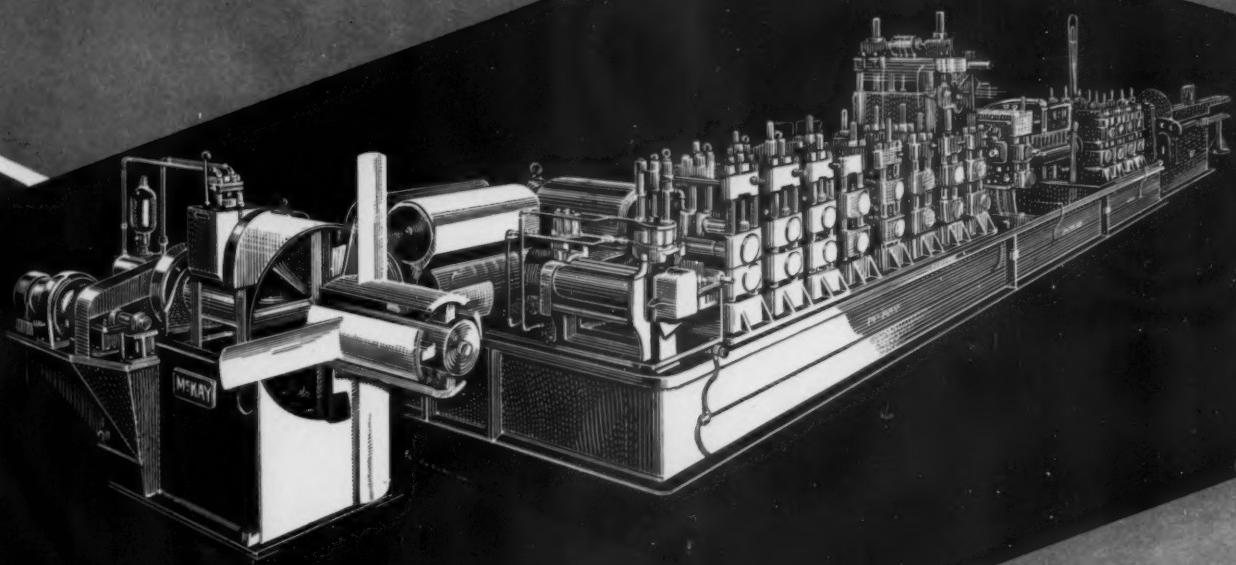
**60,000 pound, 75 inch wide—
Slitting and Coiling Line**

Years of experience have given us the ability to furnish equipment to meet every slitting and coiling requirement. Bulletin SC55 gives our complete story. Ask for it on your letterhead. No obligation.

Photos show Stamco
slitting and coiling
unit in cold strip mill



STAMCO, Inc., New Bremen, Ohio



McKay

DESIGNS AND BUILDS TUBE Mills . . .

**FOR THE MOST EFFICIENT
TUBE MAKING IN THE INDUSTRY**

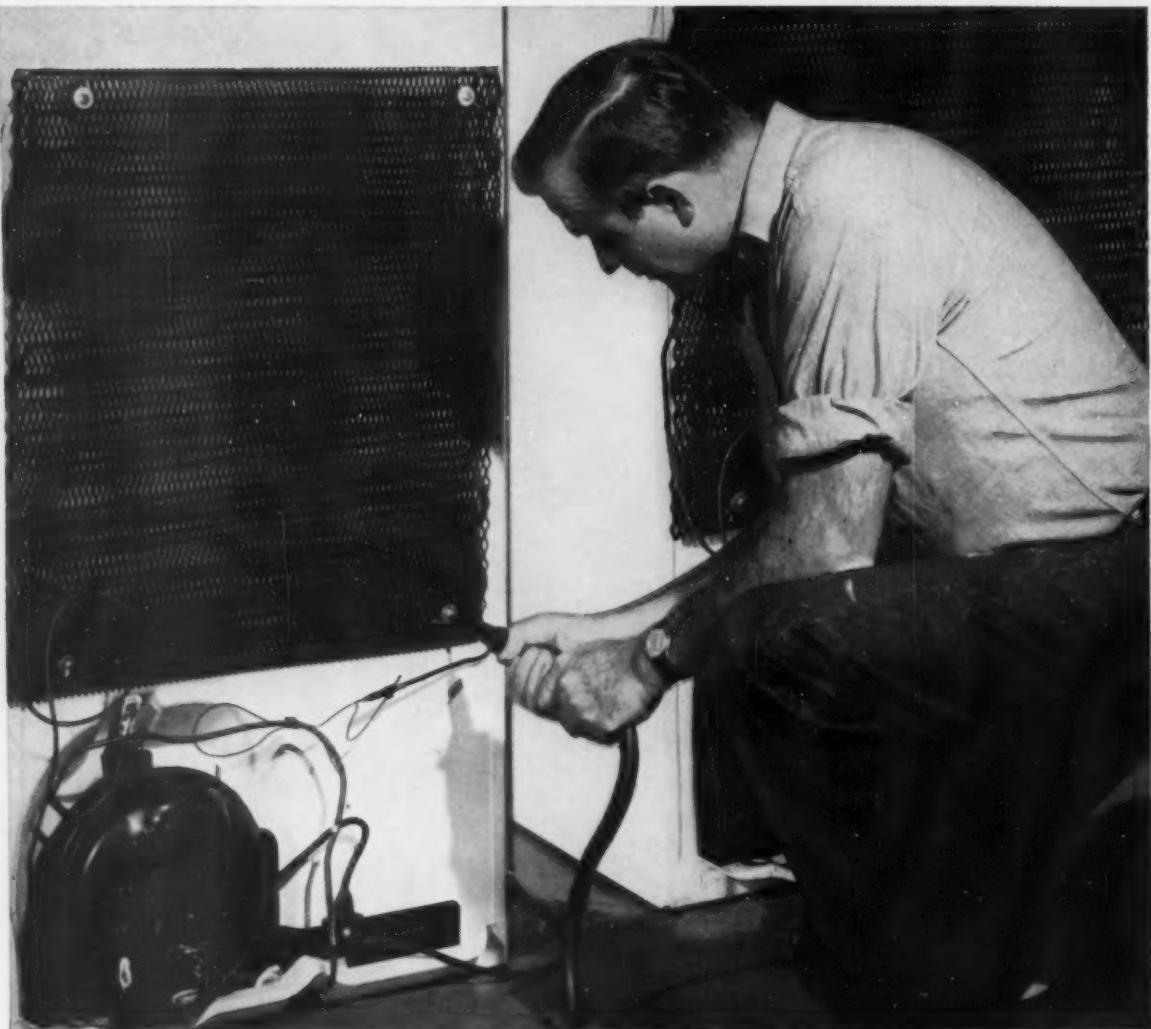
MCKAY MILLS are recognized throughout the tube and pipe making industry as the finest equipment available. Users have found McKay gives more machine for the money — that the slight extra cost of these rugged machines is more than repaid in long trouble-free service that results in real efficiency.

McKay designs and builds tube and pipe mills in all sizes.

The McKay Machine Company, Youngstown, Ohio.

9965

SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS



They may appear the same, but...

American is the name!



When you consider a source for fasteners, your real costs are based upon four factors: 1. price • 2. service • 3. quality • 4. research • You may find short-term, local price fluctuations that might seem to be worth something to you, but no-one gives you more of all four than American. • *American gives you more of all four* • In service, by timing deliveries and quantities to match any production schedule, from single case to freight car lots. • In quality, where American's quality standards are highest in the industry. • In research that produced not only the famous Phillips Head fasteners but has developed cold forging techniques replacing expensive cutting operations. You can use these same facilities to cut your fastening costs, too, for no-one gives you more of all four advantages — price, service, quality, research — than American.
Make your own comparisons: send us your inquiry for price and delivery or your specifications for special fasteners. Write:

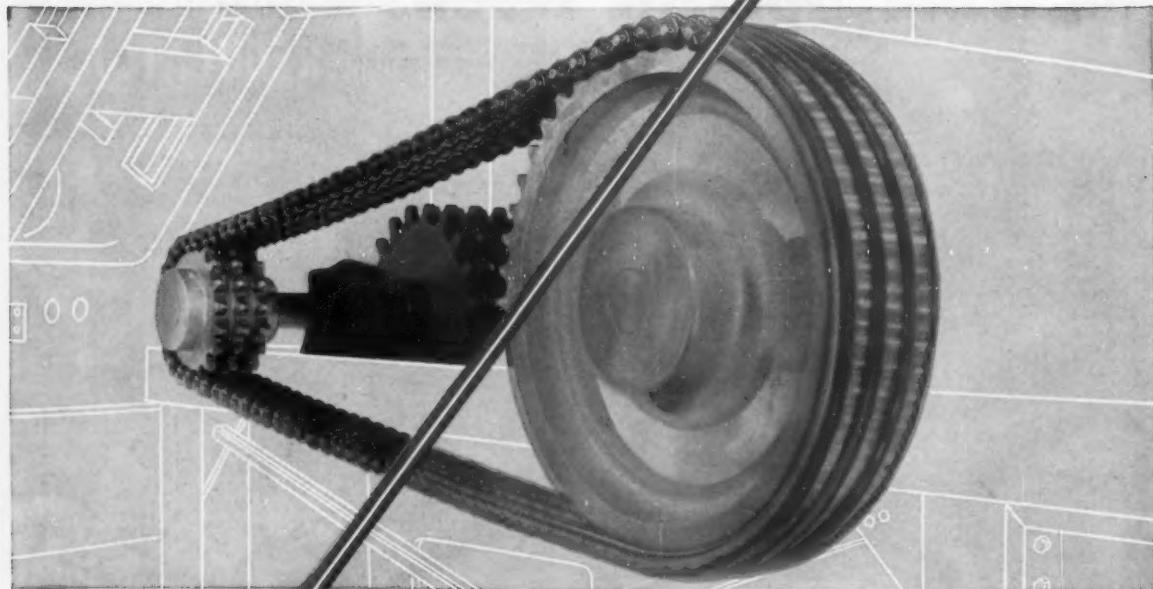


American!

AMERICAN SCREW CO. • WILLIMANTIC, CONN.
NORRISTOWN, PA. • CHICAGO, ILL. • DETROIT, MICHIGAN

Not just static strength, but . . .

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined side bars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of side bars, pre-lubrication and rigid quality control from initial selection of materials to final protective boxing.

dynamic strength

assures longer work-life for LINK-BELT Roller Chain

IN addition to known tensile loads, roller chain in motion is frequently subject to other operating stresses. Engagement with sprockets . . . shock of starting loads . . . centrifugal loads—there are many similar stresses.

Link-Belt's solution: greater dynamic strength, achieved through design, manufacturing and processing "extras" . . . plus a combination of other important refinements. And you see the results in smoother, more efficient performance that lasts measurably beyond the life of ordinary roller chain—cuts your drive and conveying costs.

Near you is a Link-Belt office or authorized stock-carrying distributor where you can get full information on

the complete Link-Belt range of single and multiple widths, $\frac{1}{4}$ to 3-inch standard pitch, and 1 to 3-inch double pitch. Ask for your copy of 148-page Data Book 2457.

LINK-BELT

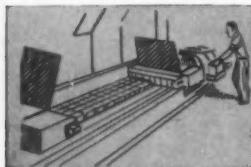


ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarborough (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

14-121

LINK-BELT gives you dynamic strength that comes from these important EXTRAS



PRE-STRESSING of multiple width chain provides uniform load distribution.



SHOT-PEEDED ROLLERS have greater fatigue life, added ability to withstand impact.



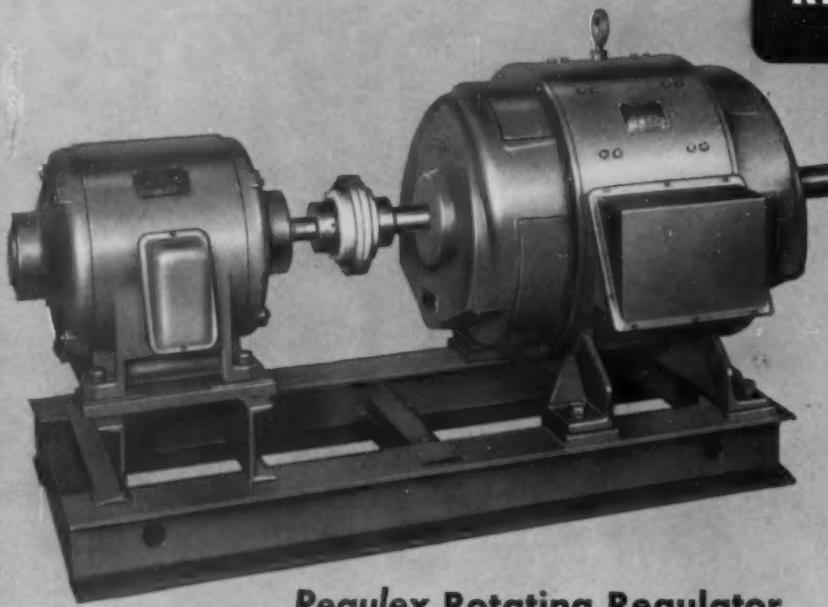
CLOSER HEAT-TREAT CONTROL —coupled with rigid testing insures uniformity.



LOCK-TYPE BUSHINGS (applied on a range of sizes) end a cause of stiff chain.

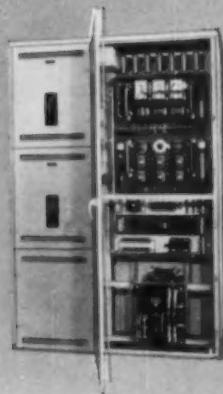
A Type and Size for Your Specific Needs

ALLIS-CHALMERS
REGULATORS



Regulex Rotating Regulator

Regulex regulator consists of m-g set and cubicle containing static elements. Cubicle may be combined with switchgear.



- Stability during high power-factor operations.
- Increased operating limits through automatic minimum excitation.
- High sensitivity and rapid response.

How It Works . . .

Automatic minimum excitation permits generator operation close to stability limit — much closer than manual operation. Sensitivity and quick response of *Regulex* regulator establish and maintain safe ratio between generator load and field current.



Magnetic AMPLIFIERS

- ... Low maintenance
- ... High sensitivity

Designed for applications requiring high sensitivity and response, where regulator is subjected to shock, or where continuous performance is a prime factor. Used in conjunction with *Regulex* unit when reversed polarity output is required. Since the magnetic amplifier has no moving parts it requires little maintenance.

For complete information call your Allis-Chalmers representative, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Where It Is Used . . .

In power plant application for voltage regulation of large generators or synchronous condensers. In industrial applications for regulating current, voltage, speed, tension, and reversing of processing mill equipment, and for arc-furnace control.

Electromechanical Rocking Contact Type Regulators



For voltage regulation of smaller ac and dc generators.

- Varies resistance in exciter shunt field by rocking action.
- Quick regulation over entire range with short movement.
- No sluggish relays.
- No vibrating or sliding contacts to wear.

Regulex and *Rocking Contact* are
Allis-Chalmers trademarks.



A-3073

ALLIS-CHALMERS

NEWSFRONT

What's Behind Those Broken Tools?

Are entry cuts breaking your carbide or ceramic cutting tools? If so, look to machine tool faults in rigidity, alignment first, advises one machine tool builder. Dynamometer tests support the findings. Contrary to expectations, they show that pressure on the tool point does not peak on entering, then drop off. Actually, pressure starts out low; builds up almost instantaneously and stays at a steady value.

Prestressed Concrete: Headed For Highways

Mammoth new highway markets may be opening for prestressed concrete. A major steel mill is reported ready to announce development of a technique for adapting prestressed concrete to road-building. Technique calls for tensioning steel before pouring. When concrete sets, compressing force exerted keeps any small cracks from widening.

With Affected Suppliers, Ford's Out Front

Auto suppliers like Ford's new "Edsel" line already, sight unseen. Slated for introduction next year, it gives them a big boost. Company's new division has already started to lay supplier groundwork; hopes to have more than 400 suppliers lined up before line is made public. Car will fall in upper medium price range.

Anyone For Vacuum Brazing?

Vacuum heating's value in bringing about improved properties of highly-alloyed metals by more effectively removing hydrogen is widely known. Not yet so well known are its virtues in the fabrication of small parts by brazing. These include better capillary flow, greatly reduced problems of flux removal. Several major aircraft firms are adding such equipment.

Nitrided Chromium: Best By Test

Nitrided chromium combines unusual wear resistance with good corrosion resistance in high temperature water applications. Tested in oxygenated water at 500 F, it suffered less weight loss than a variety of other materials, including

straight chromium plating, certain abrasion-resistant steels, and stainless type 304. Immediate applications are seen where maximum abrasion resistance and minimum galling and seizing are important in hot-water service applications.

Will Congress "Move In" On Auto Design?

Automakers fear Congress may deal itself a hand in deciding what goes into next year's new cars. Auto safety's the sore point. A House commerce subcommittee, headed by Rep. Kenneth A. Roberts, D., Ala., has been studying auto safety; may push legislation affecting design or other type auto safety standards starting in 1957.

Tracer Tools Bolster Jobbing Shops

Big assets for the average jobbing machine shop. That's the way one West Coast operator assesses tracer-controlled machine tools. His argument: the investment's small compared to the profit potential in two important areas. First, tracer machines can take on tougher jobs. Second, they slash the high cost of machining by "hard way" manual methods.

Jet Research: Heat, Height Pose Problems

Tomorrow's "hotter" aircraft engines pose rugged research problems for government scientists. Components must function, smoothly, over terrific temperature ranges. Example is making corrosion-resistant calibrated springs, for power-plant controls, to withstand -100° to +400°F temperatures. Also needed, electrical control components to "take" temperature extremes ranging from -100° to +1000°F.

Are Insurance-Paid SUB Conceivable?

Could SUB benefits, paid by an employer in a plant shutdown caused by equipment damage, be repaid to him under his "work suspension" insurance coverage? Answer's still pretty much up in the air. But some seasoned insurance men think Yes, though opinion has never come up for testing in an actual insurance case.

New mill on TIMKEN® bearings tapers 10' x 33' aluminum sheets for aircraft wings

A 4-HIGH reversing mill, 23" x 60" x 144", which tapers aluminum sheet and plate up to 10' wide and 33' long, is now in operation. This mill is used for the fabrication of tapered sheet and plate products permit the fabrication of modern aircraft of increased speed and increased carrying capacity at no sacrifice in strength. Built by the Continental Foundry & Machine Division of Blaw-Knox Company, this huge new rolling mill uses Timken® tapered roller bearings on back-up rolls, work rolls,

screw-downs and breaker blocks.

Timken balanced proportion bearings give this mill the extreme precision required in such rolling operations. Timken balanced proportion bearings have load ratings up to 40% higher than the same-size bearings in older designs. In some mills, they increase bearing life expectancy almost three times. And the mill can be stopped and restarted without altering or relieving screwdown pressures.

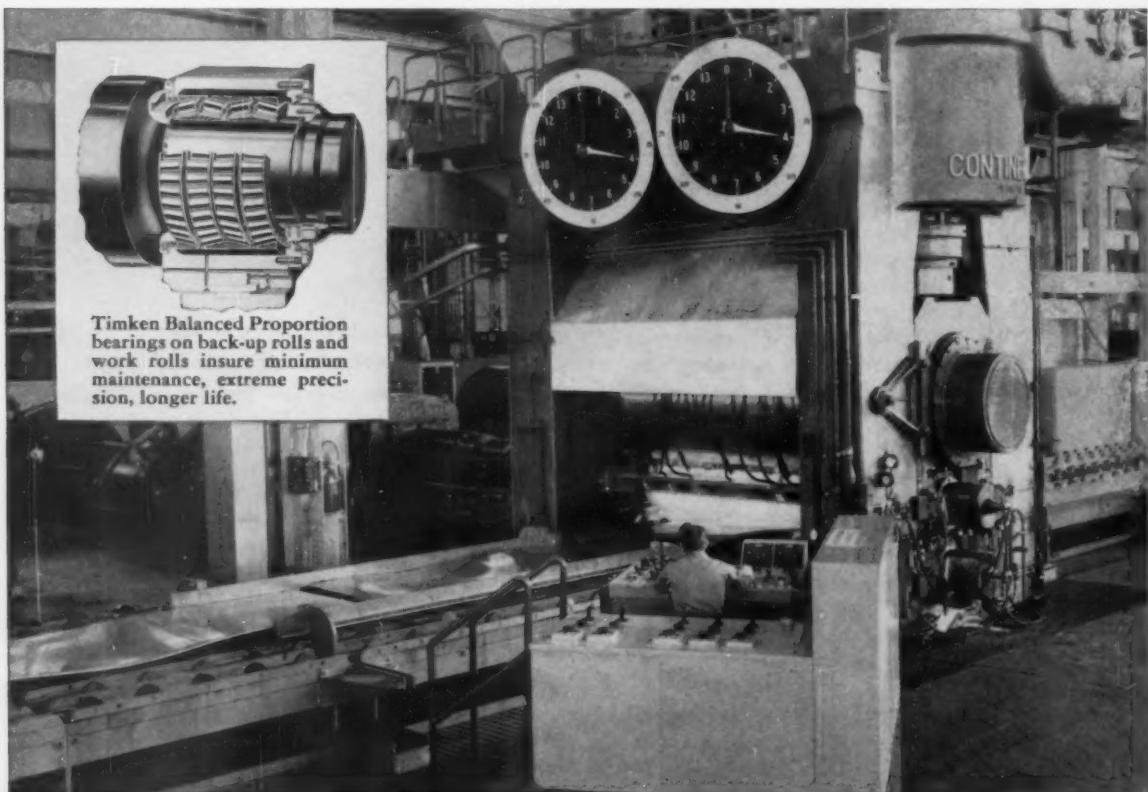
Timken bearings, because they're tapered, take both radial and thrust loads in any combination. They prac-

tically eliminate friction because they're designed by geometrical law to have true rolling motion. And made with extreme accuracy to conform to their design.

Always specify Timken bearings in the equipment you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



This symbol on a product means its bearings are the best.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



ROLL NECK BEARING ENGINEERING SERVICE

Our field and service engineers have had years of experience with problems of roll neck bearing design and operation. They'll help you select bearings and design mountings. Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

NOT JUST A BALL • NOT JUST A ROLLER • THE TIMKEN TAPERED ROLLER • BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION





Growth of Southern Metalworking

Value Added By Manufacture (in Millions of Dollars)

STATES	All Industry		Primary Metals		Fabr. Metal Prod.		Machinery*		Trans. Equip.		Misc.	
	1947	1954	1947	1954	1947	1954	1947	1954	1947	1954	1947	1954
ALABAMA	877	1,317	169	314	38	68	26	35	35	57	1	31
ARKANSAS	267	456	18	26	3	9	2	6	1	2	2	23
FLORIDA	349	785	1	5	11	52	6	19			3	10
GEORGIA	1,016	1,594	7	14	14	29	26	43			8	21
LOUISIANA	694	1,182	2	45	15	35	6	15	34	50	3	33
MISSISSIPPI	302	466			2	12	3	11			0.4	2
N. CAROLINA	1,646	2,197	6	13	11	32	17	36	5	39	2	7
S. CAROLINA	793	1,032	4	4	1	6					1	5
TENNESSEE	961	1,687	23	92	52	94	24	57	22	56	8	45
VIRGINIA	1,050	1,641	12	17	26	55	6	15	90	129	5	15
Total	7,955	12,357	242	530	173	392	116	237	187	333	33.4	192

* Not Electrical

Southern Industry Comes Into Balance

Topheavy picture of wartime industries gives way . . . New metalworking industries supply permanence . . . Industrial giants move into Southland with big, new expansion programs . . . Textiles fade—By G. J. McManus.

♦ BIG CHANGES are going on in southern industry.

The upsurge in southern industrial output and manufacturing employment is an old story. But its former topheavy picture of shipyards, textiles, aircraft, and munitions is giving way to a balanced industry that assures permanence and prosperity.

During World War II, roughly \$1.8 billion went into new manufacturing plants in six southern states. Manufacturing employ-

ment jumped 312,000. But this wave of expansion did not bring permanent or balanced growth. After the war, these shipyards and war plants turned loose workers as rapidly as they had been hired.

The new wave of expansion began in 1947. That year \$400 million went into new plants and equipment in six southeastern states. In 1953, industry increased its investment in the area by \$700 million. Last year, over \$1 billion

was spent on new or expanded facilities.

Ford Motor Co.'s new southern development is indicative of the new industry trend in the southland.

The company recently started work on an aluminum castings plant at Sheffield, Alabama. At nearby Lister Hill, Reynolds Metals is building a 200-million lb aluminum facility.

Under a unique agreement, Ford will take about 64 million lb

of molten aluminum from Reynolds each year. This will be cast into aluminum engine and transmission parts. These will be shipped from Sheffield to Ohio and Michigan plants.

Ford is no stranger to the South. The company has \$400 million invested or going into southern plants. These include four assembly centers and six parts depots. But the Sheffield construction is distinctive in that it is a basic manufacturing facility. It is the company's southernmost operation of this kind.

This move of basic automotive production to the South typifies the process that is changing the character of manufacturing in the area. Southern industry in the past has been marked by (1) a dominance of low capital operations like textiles and lumber; (2) a reliance on defense activity; (3) a metalworking group that ran to light manufacture and small shops.

In terms of overall strength, the new southern expansion has increased the Southeast's manufac-

turing employment by more than 200,000 since 1947. Value added by manufacture each year has increased by over \$3 billion.

Textiles are still the largest single industrial activity, accounting for over 20 pct of the Southeast's employment. But the trend is away from low capital industries. The textile, lumber, apparel group accounted for nearly 60 pct of the area's employment in 1939. Today, it accounts for about 40 pct. From 1952 through 1955, only 10 pct of the area's expansion was in these traditional industries.

These are the industries that are bringing new growth and stability to the South's economy:

I. CHEMICALS

The biggest postwar boom in the South has been in chemicals. Since 1950, one-half of all new chemical construction has been in the South. Discovery of a large salt dome in southern Alabama stimulated plant expenditures of more than \$27 million since 1953. Along the Louisiana coast, chemical expansion in the past two years has totaled \$186 million.

Three-quarters of the U. S. oil supply lies in the South. South-

west Louisiana is the third largest oil producing state and the recently opened Citronelle field near Mobile, Alabama, has proved out for 16 miles of low gravity oil.

3. FABRICATED METAL PRODUCTS

In metalworking, the change to large-scale, precision operations is not coming overnight. One steel mill estimates that 50 pct of its southern shipments goes to warehouses, indicating that small shops still account for a large percentage of the area's activity.

Nevertheless, southern metalworking is moving into high gear on nearly every front. In fabricated metal products, the value added by manufacture each year has increased by more than \$150 million since 1947. Current annual rate is \$100 million.

Like their northern relations, heavy fabricators in the South are hard-hit by shortage of plate and structural. In times like these, they will pull heavy steel from Pittsburgh and East Coast.

3. MACHINERY

In the past 10 years, machinery manufacturers in the South have more than doubled the value added

Who's Who In Southern Metalworking

STEEL AND IRON

Woodward Iron Co.	Birmingham	\$8.5	million
U. S. Pipe & Foundry	Birmingham	\$2	million
Southern Electrical Steel Co.	Birmingham	\$1	million
Connors Steel Div.	Birmingham	\$2.5	million
Republic Steel Corp.	Gadsden, Ala.	\$13	million
Atlantic Steel Co.	Atlanta	\$10	million
Tenn. Coal & Iron Div.	Fairfield, Ala.	.....

ALUMINUM

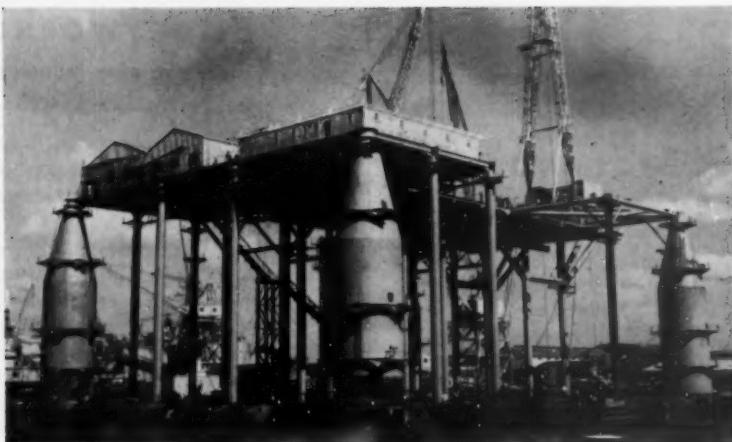
Aluminum Co. of America	Alcoa, Tenn.	\$12.5	million
Aluminum Co. of America	Mobile, Ala.	\$10	million
Reynolds Metals Co.	Sheffield, Ala.	\$102.5	million
Olin Revere Metals Corp.	Burnside, La.	\$50	million
Kaiser Aluminum & Chem. Corp.	Gramercy, La.	\$60	million

TRANSPORTATION

Ford Motor Co.	Nashville	\$10	million
Ford Motor Co.	Sheffield, Ala.	\$20	million
Ford Motor Co.	Hapeville, Ga.	\$14	million
Pratt & Whitney	Palm Beach, Fla.	\$40	million
Hughes Aircraft Corp.	Miami, Fla.	\$50	million
Lockheed Aircraft Corp.	Dawsonville, Ga.	\$50	million
Lockheed Aircraft Corp.	Marietta, Ga.	\$11.5	million
General Motors Corp.	Atlanta	\$2.5	million
General Motors Corp.	Doraville, Ga.	\$2.5	million
Ingalls Shipbuilding	Pascagoula, Miss.	\$6.9	million
Pullman-Standard Car Mfg. Co.	Bessemer, Ala.	\$1	million
American Brake Shoe Co.	Calera, Ala.	\$5	million

CHEMICAL

American Enka Corp.	Morristown, Tenn.	\$20	million
National Research Corp.	Pensacola, Fla.	\$25	million
Union Carbide & Carbon Corp.	Lawrenceburg, Tenn.	\$1.2	million



NEW DIVERSITY of southern industry is characterized by these operations: Above, offshore drilling rig at Ingalls Shipbuilding Corp. Below, aircraft assembly at Hayes Aircraft and Aluminum Co. of America plant.

by manufacturing each year. The area still lags in the proportion of skilled craftsmen. In the South it's 16 per cent against 25 per cent in all U. S. But there has been a gradual buildup of skilled workers.

4. ELECTRICAL

In electrical equipment, the value added by manufacture in the South is about five times what it was in 1947. Westinghouse Electric Corp. has six of its 62 plants in the South. All have been

built in the past six years. General Electric has four new plants in the South, plans more.

5. TRANSPORTATION

Transportation industries are beginning to move south with a rush. Both Ford and General Motors have distribution and assembly networks throughout the area. Both are strongly represented in Atlanta.

These operations are not small. Ford employs 8500 people in the

South; but the new Sheffield plant means that really heavy automotive manufacturing is coming to the South. When current expansion is completed, Ford will employ 12,000 in the South.

5. ALUMINUM FURNITURE

Aluminum furniture, blinds and similar products are enjoying a special boom in the South. Small and not-so-small aluminum fabricators are springing up all over the region. Largest concentration is in the Miami area.

6. CAST IRON PIPE

Cast iron pipe production has long been centered in the Birmingham area. The industry is currently feeling a little easing of demand, due to falloff in housing starts. However, the long-term picture is one of expanding production.

NEXT WEEK:

Basic metals production in the South.

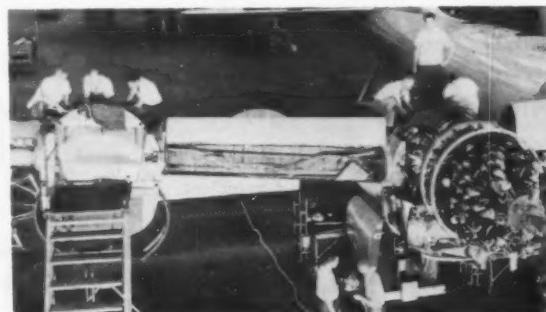
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Expansion

Olin Mathieson Chemical Corp.	McIntosh, Ala.	\$7.5	million
Olin Mathieson Chemical Corp.	Brunswick, Ga.	\$1	million
Monsanto Chemical Corp.	Anniston, Ala.	\$1	million
Monsanto Chemical Corp.	Barton, La.	.....
Dow Chemical Corp.	Baton Rouge, La.	\$50	million
Wyandotte Chemical Corp.	Geismar, La.	\$20	million
Wyandotte Chemical Corp.	Donaldsonville, La.	.....
Chemoil of New Orleans	New Orleans, La.	\$20	million

ELECTRICAL

General Electric Co.	Murfreesboro, Tenn.	.....
General Electric Co.	Largo, Fla.	.....
General Electric Co.	Salem, Va.	.....
General Electric Co.	Waynesboro, Va.	.....
Westinghouse Electric Co.	Athens, Ga.	.....
Westinghouse Electric Co.	Staunton, Va.	.....
Allis-Chalmers Co.	Gadsden, Ala.	\$1	million



FOREMEN: Keys To Teamwork

A network of clubs sponsored by the National Management Assn. produce better supervisors . . . Show cash benefits to companies . . . Aids labor relations.

♦ YOUR FOREMEN are still the key men in your production team. Lack of a forceful program to make them an integral part of management can have serious effects on your company.

Fortunately, such a program does not mean large outlays of money and executive time. Most supervisors are just as eager to learn as any vice president. On this premise, National Management Assn., Dayton, O., has been campaigning more than 30 years for self-development in the lower management strata.

Direct Benefits

The group boasts 360 affiliated clubs in the U. S., Canada and Puerto Rico. Total membership is 70,000. Its goal of providing a favorable climate for executive improvement offers three benefits to cooperating companies:

- 1) Better safety, cost reduction and production showings.

2) A more skilled corps of supervisors.

3) Leadership in both industry and community projects.

The NMA clubs have other uses. They can clear the cobwebs that sometimes shroud company policies, or build unity between all levels of management. Education programs in plant problems are setup locally, draw upon regional facilities.

Brass Too!

While 56 pct of its members are foremen, NMA points out that a hefty number of presidents and board chairmen belong, too. Many of today's brass among the membership are one-time foremen.

One thing is apparent. Companies which do have NMA clubs are enthusiastic. They are willing to assist these clubs which have proved themselves a valuable means for bolstering the foreman's position on the management team.

NMA Beats Management Problems With Clubs

By organizing a management club your company might be able to realize cash savings in unexpected quarters. Here are some cases reported by National Management Assn. members:

- At Granite City Steel, a club campaign cut the firm's accident rate from 17.4 to 7.27 in eight years. Efficiency was boosted as much as 50 pct in one department.
- In Syracuse, a city-wide club set up a job analysis program by conducting plant tours. One foreman saw how his company could cut out an etching operation—saved his firm \$25,000 a year. Another re-planned machine layout—boosted production 25 pct. A third company saved \$75,000 by adopting 135 ideas turned in by its supervisors.
- Apex Electrical Manufacturing Co. let its club go ahead with a safety drive, reduced lost-time injuries to zero; won nine safety awards; saved \$16,000 in compensation costs alone.

Paperwork:

Govt. seeks to give industry break in record keeping.

Industry will get additional relief from the dragging weight of keeping records for the federal government.

Because of the determined drive by the Eisenhower Administration to lighten the paperwork burden, an estimated \$3.75 million in savings for the businessman has been achieved. Now the Budget Bureau is ready with a plan to reduce further the chore of filling out lengthy forms which eventually are jammed into federal-agency files.

Nearly 5,000 forms used by various federal departments and offices have Budget Bureau approval. But this approval is for specified periods, and in each case the Bureau intends to find if the form is necessary. If it serves no good purpose, the form can be eliminated.

How Useful?

Test of the usefulness of reports have been decided on by the Bureau. They will be examined to determine if the information sought is essential and if it cannot be found in existing reports.

The Bureau also wants to insure that a form is as simple to use as possible and that the data on it is collected no more frequently than absolutely necessary. In addition, demands for information are to be made only to that segment of industry which can be expected to provide it.

No Antitrust Border

A firm is not immune to American antitrust laws simply because the markets it agrees to divide with potential competitors are foreign, U. S. Supreme Court rules.

The high court says the Holophane Co., Inc., a manufacturer of prismatic glassware, must dissolve alleged agreements whereby its predecessor company and its British and French counterparts divided world markets. In effect, the decree directs the firm to seek customers in the overseas territories previously reserved to the foreign companies.

TALENT: Contest Clicks In Science Search

Annual science scholarship program at Westinghouse dramatized with the name "talent search" . . . Draws over 15,000 high school seniors competing for honors . . . Most finalists stay with science.

◆ SCIENTIFIC educations are getting a badly needed merchandising push from industry. Companies and educational groups are finding that the techniques of beauty contest promoters work wonders in channeling high school students into technical study.

Westinghouse Electric Corp. has pioneered the new approach. Working through the Science Clubs of America Westinghouse awards scholarships to 40 high school graduates each year. Under this program, awards totaling \$165,000 have gone to 460 men and 140 women over the past 15 years.

Method Counts

Effectiveness of the Westinghouse program comes not so much from the direct awards as from the way winners are selected. The company has dramatized its selection process with the name, "Science Talent Search." More than 15,000 high school seniors compete each year. Each is judged on the basis of an essay written on some scientific project, on a three-hour test, and on school records.

The field—on this initial showing—is narrowed down to 300 and then finally to 40. These 40 are taken to Washington for five days. A three-man board interviews the finalists and selects the top student.

The winner gets a \$2800 scholarship; the remaining 39 get awards scaling down to \$100. Certificates of honorable mention go to 260 of the nationwide contestants. These certificates are not empty honors. It's estimated that over \$4 million in outside scholarships went to the 4200 who received honorable mention or better in the Talent Search.

The method has worked very

well in turning up genuine prospects for scientific work. Over 90 pct of the finalists have bachelor's degrees; 60 pct have master's degrees; and 45 pct have doctor's degrees. There are 307 now in schools; 62 on faculties of colleges, and 75 in industrial or institutional research.

A Talent Search alumnus, R. R. Schiff, feels the publicity, the trip, and other trimmings play a big

part in its success. He says the finalist gains prestige at a time when he might be overshadowed by athletes. The trip to Washington brings him into contact with other advanced students.

And finally, says Mr. Schiff, the trip and contest provide immediate, specific goals for students: stimulating interest in science at a time when long-range benefits are hard to appreciate.

Research Curiosity Leads to Big Payoff



Granite City Project

Granite City Steel Co., Granite City, Ill., will construct a sintering plant and two new batteries of soaking pits. This is part of the plan to increase ingot capacity to 1,584,000 tons within two years.

Construction has already begun on the soaking pits, with completion expected in about 9 more months. Work on the sintering plant will begin in March. It is scheduled for completion in about one year.

Company believes the sintering

◆ COAL RESEARCH is the interest of 17-year-old Carol Hawkins, a scholarship winner in the Westinghouse Science Talent Search. While working on her winning project paper—"Coal Microscopy: A New Tool in Coal Research," Carol used some of the research facilities of Carbide and Carbon Chemicals Co. Typical of these activities was the illustrated preparation of microscopic slides for examination.

In another phase of activity, Carol made inspection trips through West Virginia coal mines to learn about the methods and problems common to mining coal.

plant will spur production of about 10 pct more iron from its two blast furnaces.

The bed of the sintering machine will be 8 ft wide. General contractor for the sintering plant is Arthur G. McKee Co., Cleveland. When it is completed Granite City Steel Co. intends to use 40 to 50 pct sinter in its blast furnaces.

Surface Combustion Co., Chicago, is the general contractor for the soaking pits. Wolf Construction Co., Granite City, is the prime construction contractor.

CHRISTMAS: To Give Or Not To Give?

American Management Assn. survey finds presents for customers and business friends are the rule . . . Seat of the resistance in purchasing agents . . . Sales managers are in favor—By G. G. Carr.

♦ TO MANY an executive, the holiday season brings back an old problem: what to do about Christmas gifts to business friends and customers.

The largest volume of business giving is aimed at good customers. But many businessmen consider Christmas a good time to say thanks for help and courtesies from other than customers. One executive says: "I've been around this business for almost 40 years. A lot of people have been darn nice to me. Christmas is when I try to show them I haven't forgotten."

Rarely are Christmas gifts called unethical. Some companies are curbing acceptance of gifts by their employees. But custom is all for it.

Survey

Feeling in favor of giving is stronger with sales managers than purchasing agents.

An American Management Assn. survey of gift practices last Christmas found a little over half the sales managers respond-

ing gave Christmas presents to customers. Almost one-third of the purchasing agents tried to discourage their people from accepting gifts from suppliers. Today's common practice of sending gifts to homes rather than offices blurs the distinction between business and personal giving, helps recipients accept gifts without qualms.

Blotters To Antiques

Sales managers answering AMA average \$3,650 yearly for Christmas gifts. Average cost per customer is \$7.51, lists average 754 people. About half the sales chiefs give from custom; a third classed the gifts as tokens of appreciation or remembrances and about 15 pct called their yule spirit promotional. Almost all agreed the effect on business failed to justify the expense.

Corporations give everything from blotters to antique furniture and china, reports Ellen Seabrook, Seabrook & Co., New York business gift and packaging consultants. But there seems to be a

trend away from mass distribution of gimcracks to better quality, more carefully chosen presents to selected recipients. Top management is becoming more interested in what goes out as the firm's holiday greetings.

"Candy is dandy but licker is quicker," still seems the favorite slogan. But more firms now shy away from anything to do with demon rum. It can backfire too easily. Many businessmen don't drink and some have strong feelings on the subject. And any host knows how fast a full fifth of good wishes turns into another dead soldier in the trash can. Finally, many wives have waxed vocal about impromptu office parties to sample the presents.

Family Plan

Top firms in growing numbers are turning to gifts the whole family can enjoy, reports Mrs. Seabrook. These range from cigarette lighters to fine furniture to specially commissioned etchings and lithographs from famous artists. But don't get in a rut. There are fashions in gifts too. "Everybody was giving each other carving sets a year or two ago. I wonder if there was something subconscious in it," reports Mrs. Seabrook.

Boss Gets More

When brass gives to brass, the gifts get more lavish. Executive suite gifts popular in recent years have included antiques, expensive shotguns, imported camels hair polo coats, and Siamese silk bed jackets (for the ladies, of course). But cost is not the real object. The closer to the receiver's interests, the more care shown in selection, the more appreciated the gift.

Here's How In Business Giving

Seabrook & Co. offers these guides for business giving:

1. Never, never give money. Gift certificates are acceptable, but they don't show much imagination.
2. Don't be afraid to flatter the recipient's taste.
3. Try to match gift to person.
4. Books are practically surefire. Phonograph Records are almost as good.
5. Be sure clothing and similar personal articles can be easily exchanged without embarrassment.
6. If gifts are marked with company name or trademark, keep it small and inconspicuous.
7. Fine cheeses and other nonperishable food delicacies can make a superb gift at low cost.

INSURANCE: Look Beyond Plant Damage

Business interruption loss often exceeds property damage . . . Value of business interruption insurance borne out by Pittsburgh Steel study . . . AMA conference covers major angles of problem—By K. W. Bennett.

♦ How good a risk is "Business Interruption Insurance?" Even steel men carrying these policies admit that, in a period of low operations, such insurance coverage might be more liability than gain. American Management Association says business interruption insurance is "the least understood of important insurance coverage." It devoted a major part of a seminar at Chicago to the subject.

Business interruption insurance covers the loss of profits from a plant disaster—shutdowns due to explosion, fire, or machinery failure. Pittsburgh Steel, for example, insures its entire operations for a value equal to 80 pct of estimated net profits. Property damage policies cover actual physical losses.

The business interruption policy covers profit losses due to failure to fill customer orders; or sales effort that was wasted because the product couldn't be delivered.

What Study Showed

The point made: a minor property damage loss can cause a considerably greater loss in profits. In analyzing the advantages of business interruption insurance, Pittsburgh Steel discovered that in 15 out of 21 test cases, the proven amount of business interruption loss exceeded the actual physical plant damage costs.

In one case a \$437,115 physical damage loss caused a proven business interruption cost of \$435,692. Again, a \$45,000 physical damage loss cost \$400,000 in interrupted business costs. In the 21 test cases examined, physical property damage cost \$380,904 as compared with a figured business interruption cost of over \$2,654,256.

Under a business interruption policy, it is possible to protect the

firm against such selling cost losses as advertising, travel expenses of salesmen, sales office rentals, even certain supervisory salaries. Administration costs can also be insured. It's possible to insure payroll costs, but premiums are stiff.

Collection Procedure

Industrial policy holders agree that the insuring company is not going to walk into the plant the day after the disaster with a fat check on a serving tray. It's possible to collect quickly on fairly small sums but proof of loss is mandatory. It is necessary to prove a loss in expected profits, possibly without having to prove an actual sales loss, but this involves some give-and-take on the part of the insurance company and the insured.

In most cases, actual sales losses are used as supporting evidence of loss of profits. Increased costs for expediting manufacture after a disaster are used. In one example given, a steel mill which has suf-

fered an accident to its primary mill and must buy slabs from another steel producer at a cost higher than that of steel slab produced in its own primary department, may recover the additional cost of the slab.

Business Grows

When a new plant was hit by a hurricane while under construction, the owner proved profit loss and also was able to recover costs for expediting the re-erection of the plant. In this case, the operation date of the plant was set back three weeks. He recovered estimated profits for production that would have come from the plant during that period. He knew exactly how much the plant would produce, and he had a sellers' market that would have insured capacity operations.

It's significant that business interruption insurance users who took out policies at the beginning of World War II, retained their policies and are augmenting them.

RESEARCH

♦ TAKING AN X-RAY snapshot of metal samples is a simple job with this machine designed by Dr. Abraham Taylor of Westinghouse Research Laboratories. Its exceptionally high power permits exposures 15 times faster than any comparable device now in use, Westinghouse says. Pictures of metals as hot as 3000°F can be taken in a matter of minutes. Thus, atomic structure is studied before metal vaporizes or undergoes chemical change at the high temperature. The device is being used primarily for fundamental research in the Pittsburgh laboratory.



SHIPPING: Can Survey Show Cost Cuts?

ICC member wants independent, private survey of transportation methods . . . Howard Freas believes study would show areas where traffic could move at less cost by other methods . . . Who'll finance?

♦ DO AMERICAN shippers get a fair return for the dollars they invest in freight movement?

Not according to one member of the Interstate Commerce Commission who proposes an objective study to locate the most economical means of transportation.

Commissioner Howard Freas suggests that a privately-backed, competent survey of conditions prevailing in the transportation field would disclose:

1. Areas in which traffic is moving by one form of transportation, when another would do a better job.

2. The effect of switching traffic to the means of transportation which can do the job best.

3. Estimated savings that could be expected when freight is shipped in the most economical way.

This study, says Mr. Freas, would enable the public to decide which carriers make valid claims as to the services they offer. It would help the carriers to locate the operating areas where they can work most profitably and also aid the ICC in settling intercarrier disputes. He disclaims any intention by the government of assigning traffic to a specific type of carrier.

Why Now?

An examination of the transportation industry now, when neither depression nor wartime conditions exist, would be highly valuable to shippers, carriers, and the government, Commissioner Freas believes. It might be undertaken and financed jointly by all categories of carriers, or it might

be the work of a research foundation, he says.

One expensive factor for the shipper now, the ICC official points out, is the movement of freight by some high-cost carriers whose presence in the field diverts traffic from carriers with lower costs. High-cost transport lines assign a "disproportionate share" of the freight costs to other shipments, at an eventual higher cost to the shipper.

Shippers using ICC-regulated carriers have an annual transportation bill of more than \$18 billion. If even a small percentage could be saved by locating the most economical means of shipping, Mr. Freas argues, the public is entitled to that saving. He hopes to show this in the study.

TANKERS:

Suez crisis means new tanker boom.

A new boom in construction of oceangoing tankers, brought on by the Suez crisis, is looming for U. S. shipyards.

The Maritime Administration is considering proposals to build up to 31 large new tankers in yards in this country. A year ago they were in the throes of a long business drought.

If the proposals are approved by the Administration, and thus receive various government subsidies, the already-tight steel plate market will be in for another shock.

Foreign Flags

Included in the proposals now before the Maritime Administration are 11 new tankers for operation under foreign flags, and up to 20 more for operation under the U. S.

flag. Three of the ships, one for operation under the U. S. flag and two for operation under foreign flags, would be in the supertanker class of 100,000 deadweight tons.

All ships built with government subsidies, whether operating under the U. S. or foreign flags, will be available to this country for use in an emergency, and none may operate on trade routes forbidden to U. S. ships.

If approved, these ship construction proposals may affect the government's plan to underwrite a new program of ship construction. The government program, now under study, called for the government to order up to 50 tankers to be built, and as many as possible sold or leased to private firms. The 31 ships now being proposed may be included in this program, thus reducing the number on which the government would have to force construction.

ICC Delays Hearings

The threat of higher railroad freight rates has been eased somewhat by a new government postponement of the deadline for comments from shippers.

The Interstate Commerce Commission has given no indication as to whether or not an average 15 pct increase in rates will be granted. But it set Dec. 24 as the date for shippers and other interested parties to submit their views on rates in verified statements to the ICC. Farmers have joined industrial shippers in protesting the rate boost, and Agriculture Secretary Benson has asked the ICC to go slow in raising rates.

In addition to the average 15 pct increase being asked of the government, the railroads have pending at the ICC a separate petition for rate increases averaging 7 pct, for a total of 22 pct.

EXECUTIVES: Check List For Promotion

AIM study indicates ability alone is not enough . . . Integrity and industry should be given more weight in executive selection . . . Here is an aid in pinpointing prospect's qualifications for top job.

ABILITY

- Does he know his job?
- Can he make decisions?
- Are his intellectual resources adequate?
- Has his division or department forged ahead of competition since he was placed in charge?
- Are his reports concise, accurate, and well organized?
- Can he distinguish the relative importance of different tasks?
- When quick decisions must be made, does he generally make the correct ones?
- Is he tactful?
- Does he anticipate needs, foresee and meet changing conditions?
- Does he reserve adequate time for policy matters?
- Is he a widely read and well informed individual? Does he retain facts and ideas?
- Is he able to interpret financial statistics and business indices, understand accounting processes?
- Does he delegate enough authority and responsibility?
- Has he obtained loyal and capable assistants?

INTEGRITY

- Does he contribute independent thinking to discussions?
- Has he respect for the leadership of his superiors?
- Does he show confidence in his subordinates?
- Can he give praise wholeheartedly when warranted?
- Are his personal standards of accomplishment high?
- Has he made himself an integral part of the organization?
- Do his plans for the future include the company?
- Is he respected and trusted in his community?
- Does he devote adequate time to civic activities?
- Has he a good credit record?
- Does he permit constructive criticism by his friends and business associates?
- Is he tolerant of persons of other religions, races, or customs?
- Is he tolerant of opinions which oppose his own?
- Can he admit mistakes readily?
- Does he control his emotions?

INDUSTRY

- Is his work thorough, showing study of all possibilities?
- Does he work steadily without growing discouraged?
- Is he a "self-starter?"
- Does he bring a specific job to completion? On schedule?
- Is he observant?
- Has he continued to study and learn in his present position?
- Does he take an interest in company functions—sales, production, finance—not his immediate responsibility?
- Has he educated himself for the position above his own?
- Has he added to his responsibilities in his present position?
- Has he developed a replacement for his own position?
- Does he keep himself physically fit?
- Does he maintain contacts with his field through trade publications and associations?
- Does he have long range work goals?
- Is he generally prepared with facts or figures to substantiate his ideas?

♦ DOES YOUR company have a good record for selecting its executives? Even if it has, there's probably room for improvement.

A study of executive selection systems by the American Institute of Management indicates that ability is too often made the sole basis for selection of executives.

Instead, an evaluation of the prospect's industry and integrity can be of great importance in choosing executive material from among employees.

The problem in selecting executives stems from one of two

difficulties, the Institute notes. Either the business leader does not understand what qualifications the position actually requires; or he does not know how to measure the candidates in terms of these qualifications.

Here is a check list prepared for the Institute for guidance in making the selection of men to take on greater responsibilities. It should provide a simple, but effective yardstick for evaluating candidates for executive positions.

Checklist is slightly abridged, but contains most important points.

Overemphasis on ability, the Institute points out, is a natural one. A company is justified in determining at once if the candidate can do the job, but should be well aware that lack of integrity and industry can negate the greatest talent.

Integrity includes honesty and a sense of responsibility. Industry consists of diligence and initiative. All three categories should be weighed in evaluating a candidate for a top position in your company. They can avoid the mistakes of trial and error.

AIRCRAFT ENGINES: Jets Hold Spotlight

With military's needs dominating, jet engines pace industry's growth . . . High development costs and rapid obsolescence cause production headaches . . . Piston engines still major market factor.

◆ AIRCRAFT ENGINE makers are mapping continued high flying.

Total value of shipments for 1956 will be about \$1.9 billion, and 1957 could be significantly higher. The freely-predicted boost in defense spending could shoot the sales curve off the top of the graph in the next few years.

Jets hold the spotlight, but don't write off the piston engine. It will be a major product for at least 10 more years, and should stay an important aircraft powerplant for even longer. At least 41 major airlines are using piston engines exclusively, and one plane can chew up several engines through the normal life of the

airframe. What's more, jets are hardly mentioned yet for the fast-growing small plane market.

Jet Conversion Gains

But the piston engine may have run out of gas as far as growth is concerned. Designers have pushed it almost to its goal of just under 1 lb of weight for each horsepower. In terms of growth, jets today are comparable to piston engines in the days of the Wright brothers. The military is stressing jet conversion, reports that the '57 air force budget doesn't allow a dollar for piston-powered aircraft. Similarly, 77 pct of all new engines accepted by the Air Force in 1955 were

jets. Remainder were spare piston engines for replacements.

The military dominates the aircraft engine business. In 1956, military orders will account for over \$1.6 billion of the total \$1.9 billion. But the civilian share of \$302 million is higher.

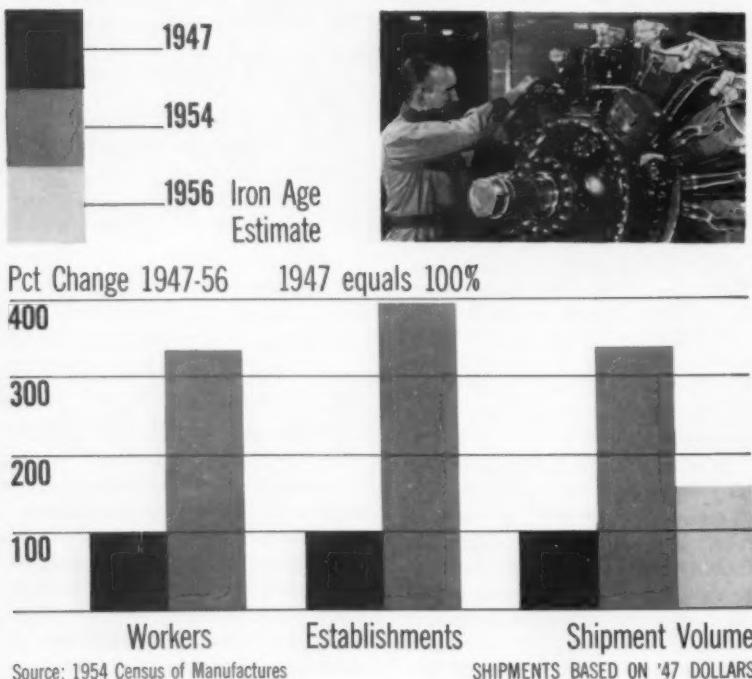
Biggest headaches to engine-makers are the high cost of development and fast obsolescence of new jets. Tab for developing a new jet is about \$50 million. This doesn't include tooling and other production costs if the engine gets that far.

Development Pace Rapid

This fast development can really hurt. Most of the 88,000 jets delivered so far to the Navy and Air Force have been made in the last 5 years. The '47 models had thrust ratings of 3400 to 5000 lb. Korean vintage engines ran 6000-6500 lb, with today's range at 8000-12,000. Engines of 15,000-lb thrust are coming soon, with 25,000-lb models now moving off the drawing boards.

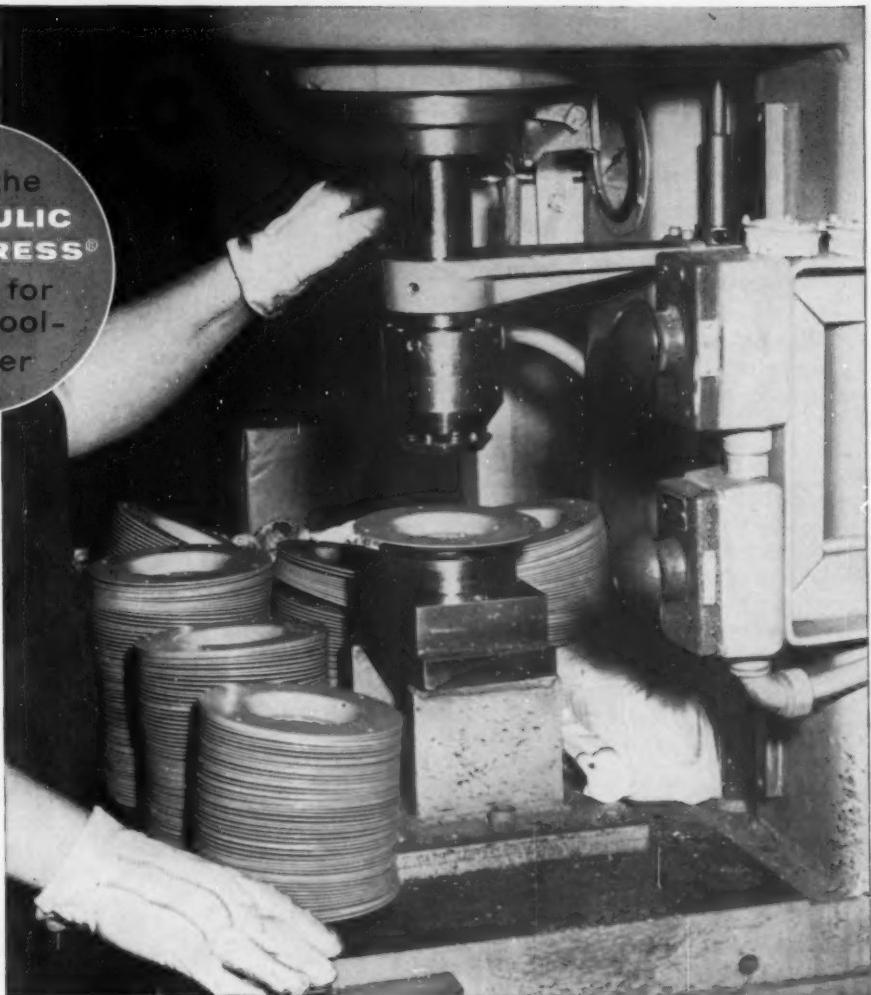
Civilian jets and turboprops will start flying about 1960. These will be based on military models, but with considerable modification. U. S. airframe builders have already designed three types of jet airliner and one turboprop transport for airlines here and abroad. Virtually all will be powered by commercial versions of U. S. military engines, although dollar shortages forced a few overseas customers to substitute foreign engines.

Sky's the Limit for Air Engines



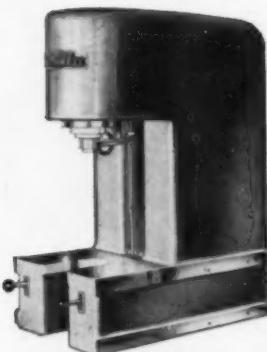
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How the
**HYDRAULIC
MULTIPRESS®**
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Whirlpool-
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MULTIPRESS®

assembles automatic washer parts daily...by the thousands



8-ton Denison
hydraulic Multipress

All automatic washers, made at the rate of several thousand per day by Whirlpool-Seeger Corporation, require a stamped steel brake disc.

Rivers assemble the stamped discs to flanged hubs die cast in zinc alloy. The two parts are positioned together, rivets passed through small holes in the bottom of the stamping, projecting inside the dished portion of the disc. The four rivets are then upset, fastening the brake disc permanently to the hub.

With the 8-ton Denison hydraulic Multipress, the riveting operations are performed with perfect uniformity. Smooth, controlled hydraulic action of the ram avoids a sharp blow, yet applies the proper pressure to the rivets.

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EXPANSION IN INDUSTRY

Heat and Flame

Massachusetts Steel Treating Corp., Worcester, Mass., is adding a new, large capacity induction and flame hardening plant. Project is adjacent to the present plant at Worcester.

The equipment, including a new 50 kw General Electric induction heater, and a GE electronic heat treating machine, is being housed in a new specially designed building.

Because of production schedules the machines are being pressed into use as soon as they are installed, without waiting for completion of the entire project.

Machine Tool:

Project will up production by 25 pct.

Warner & Swasey Co., Cleveland, will expand its New Philadelphia, O., plant for the purpose of increasing machine tool production capacity by about 25 pct.

The addition will contain manu-

facturing and storage space of about 33,000 sq ft. It is expected to be ready for occupancy by April 1957.

Construction of another addition for the sheet metal works is scheduled to begin within a few weeks.

The initial project will require the purchase of some 22 new machine tool units before it attains full production. It will also add from 150 to 200 men to the company payroll.

Build A Bigger Still

The Fluor Corp., Ltd., Los Angeles has been awarded a contract for the engineering, procurement and construction of an 80,000 barrel per day vacuum pipe still, by the Texas Co.

Engineering work will be performed at Fluor's Los Angeles laboratory. The completed unit is scheduled for installation at the Texas Co.'s Port Arthur, Tex., refinery.

Construction will begin in February 1957, with completion expected in December.

The new unit will replace an existing vacuum pipe still with a 60,000 barrel per day capacity, for a net increase in the daily capacity of the refinery of 20,000 barrels.

Expansion Briefs

Cleveland Cap Screw Co., Cleveland; constructed new plant; cost, \$5 million.

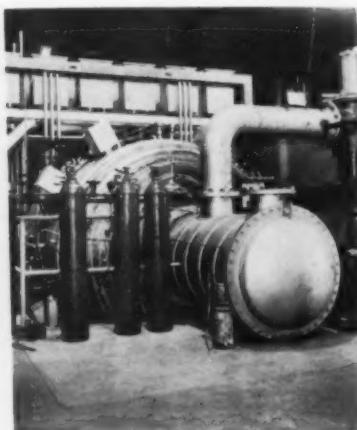
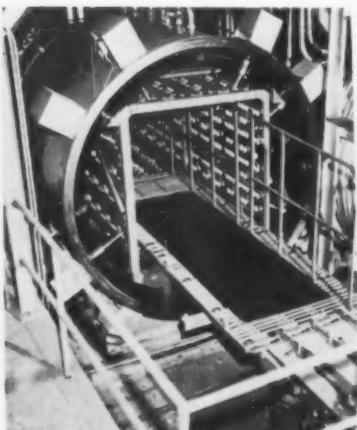
Youngstown Sheet and Tube Co., Youngstown, O.; constructing battery of 76 coke ovens; Campbell Works; part of expansion plant; \$250 million.

Arthur Colton Co., Div. of Snyder Tool & Engineering Co., Detroit; expanding punch and die facilities; Mancelona, Mich.

Arthur D. Little, Inc., Cambridge, Mass.; management consultants; constructing new building, Acorn Park, Mass.

Calumet & Hecla of Canada Ltd.; will build seamless tubes plant at London, Ont.; cost about \$7.25 million.

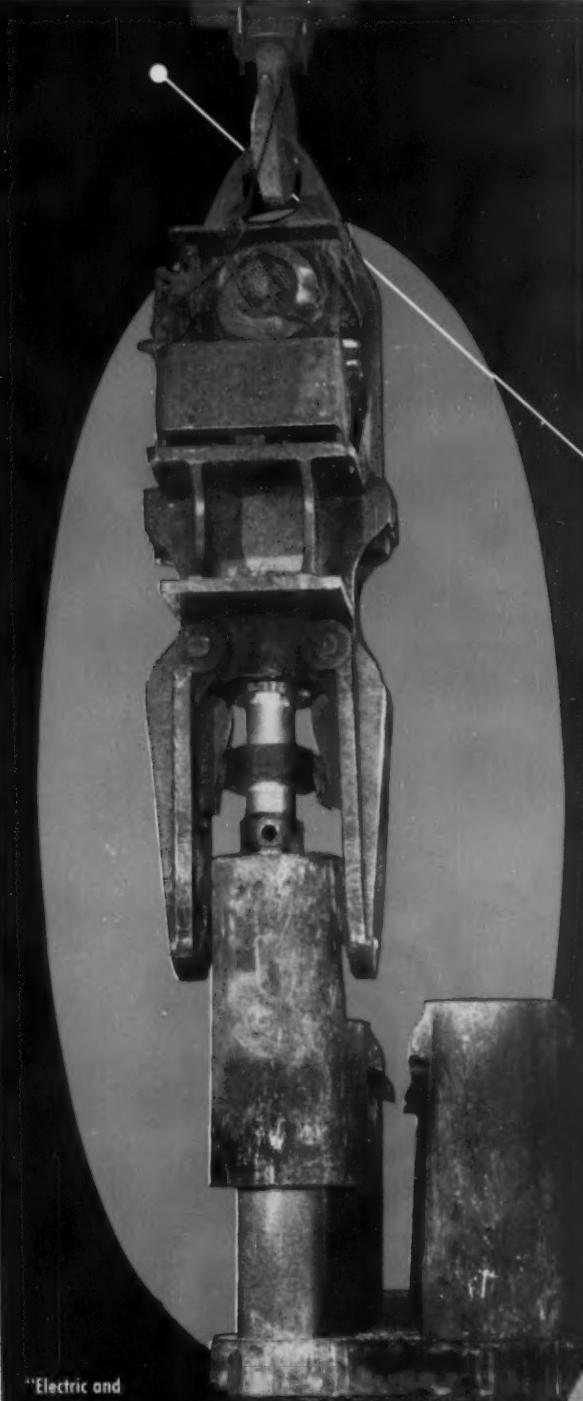
Something New for Titanium



◆ VACUUM annealing furnace of a new design geared specifically for handling titanium has been put into operation at Mallory-Sharon Titanium Corp., Niles, O.

The unit was built by Westinghouse Electric Corp. from specifications of both Westinghouse and Mallory-Sharon engineers. Several tons of sheets per charge can be loaded flat on the charging car, which is rolled into the furnace (left). Sheets can also be suspended vertically.

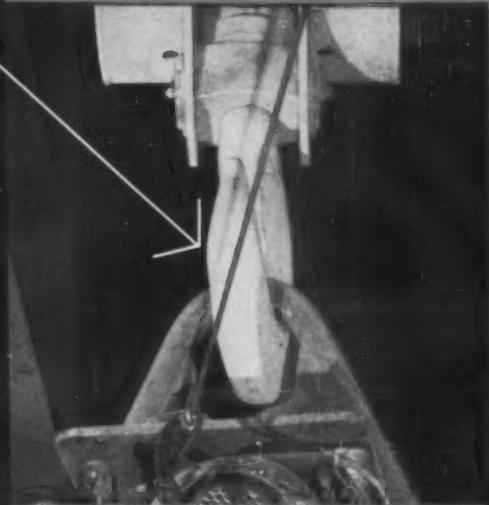
Charging end of furnace (right) can be swung out.



"Electric and
Open Hearth
Steel Castings
from 1 lb. to
100 tons"

Photo Taken at
WEST VIRGINIA STEEL CORP.
Huntington, West Virginia

portable ingot stripper



**lower cost...
greater efficiency**

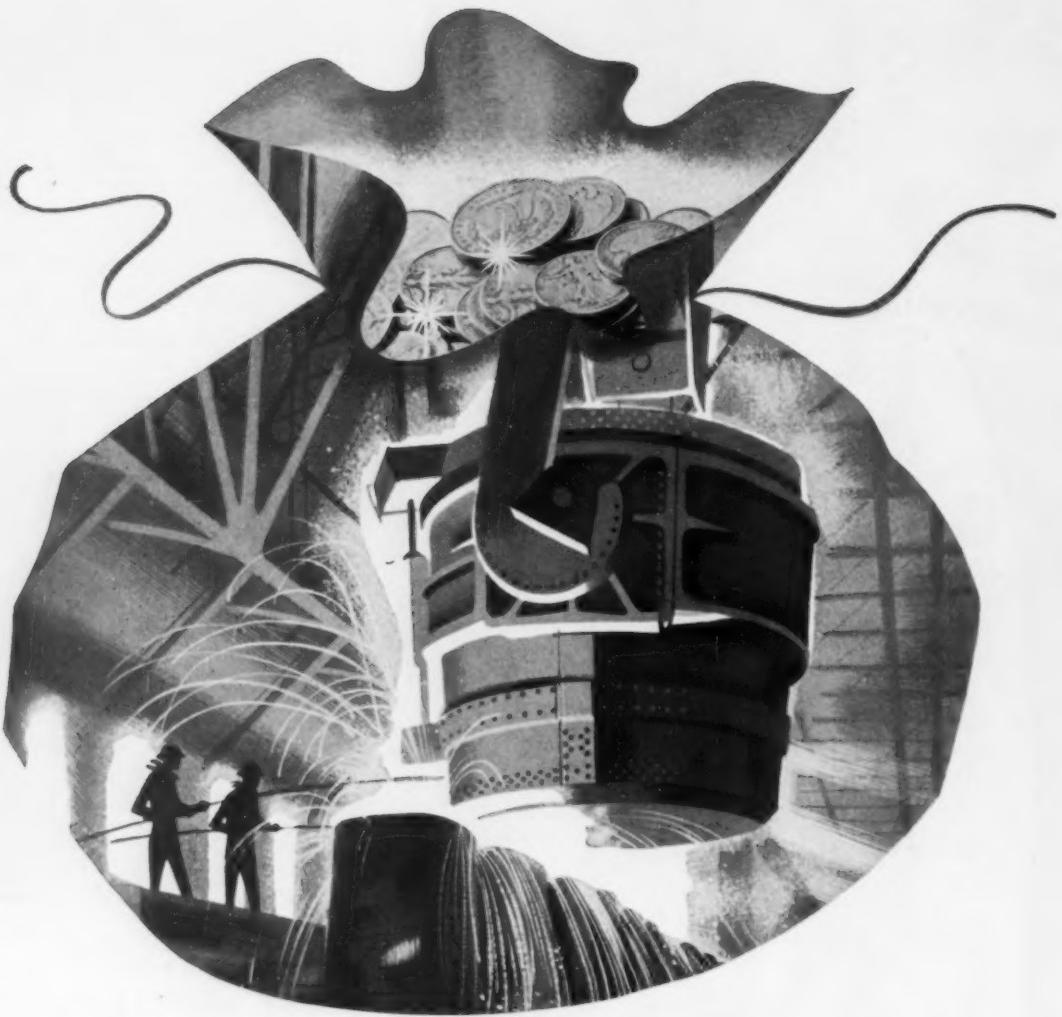
Present users of our Portable Ingot Stripper report savings in mold cost and reduced overhead expense as the crane can be used for other jobs when the stripper is not in use. Two sizes available—250 and 450 tons—easily modified to handle hot tops.

**Write for New Portable
Ingot Stripper Folder**



Division of Pittsburgh Steel Foundry Corporation

P. O. BOX 986, PITTSBURGH 30, PENNSYLVANIA
PLANT AT GLASSPORT, PENNSYLVANIA



CUT COSTS save—the Grainal way!



Vancoram Grainal Alloys are reliable, produce remarkably consistent results . . . and they're economical.

The reliability and efficiency of Grainal Alloys for improving hardenability have been proved in millions of tons of boron steels. What's more, Grainal Alloys can be incorporated into conventional steelmaking practices with no major changes.

In stainless and heat-resisting steels, small additions of Grainal Alloys improve hot-working characteristics, cut conditioning costs and re-

jections. That adds up to important savings, especially in the higher alloy grades that are prone to develop cracks and other surface defects. Grinding, chipping, scarffing—the loss of good metal can be kept at a minimum.

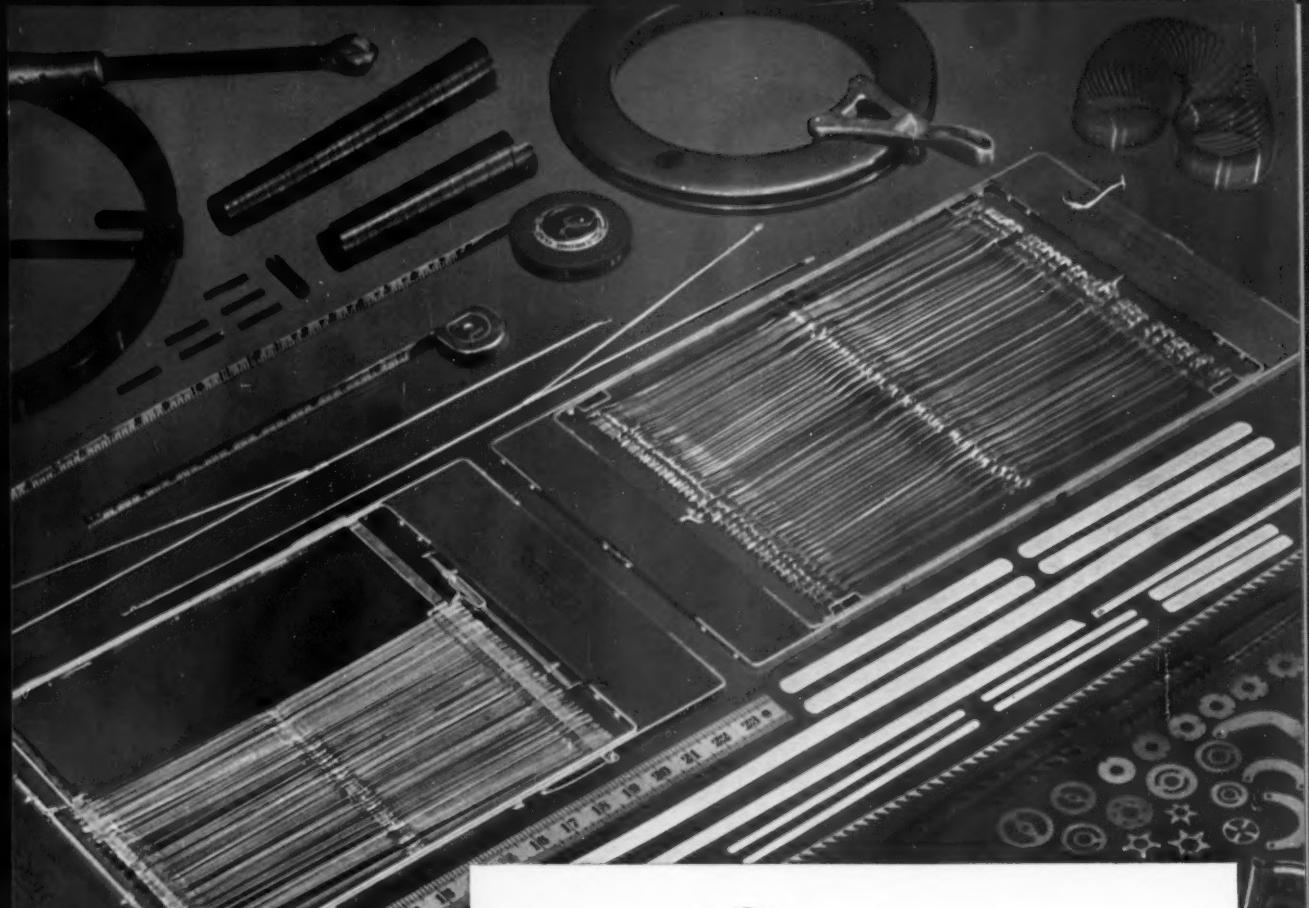
For complete information on Grainal Alloys and other Vancoram products, contact your nearest Vanadium Corporation District Office.

Write today for your free copy of "Grainal and Its Use."



VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y. • Pittsburgh • Chicago • Detroit • Cleveland
Producers of alloys, metals and chemicals



MEMO TO:

You

YOU MIGHT AS WELL try
to count the beans in a carload
as the number of parts that are made of Roebling High
Carbon Specialties, Flat Wire and Spring Steel. These
Roebling products are unsurpassed for mechanical and
dimensional uniformity . . . for speeding manufacturers'
production and cutting costs.

Next time you order cold rolled high carbon wire or
spring steel specify Roebling. Strictly on its performance
you'll probably become a steady customer from then on.
John A. Roebling's Sons Corporation, Trenton 2, N. J.

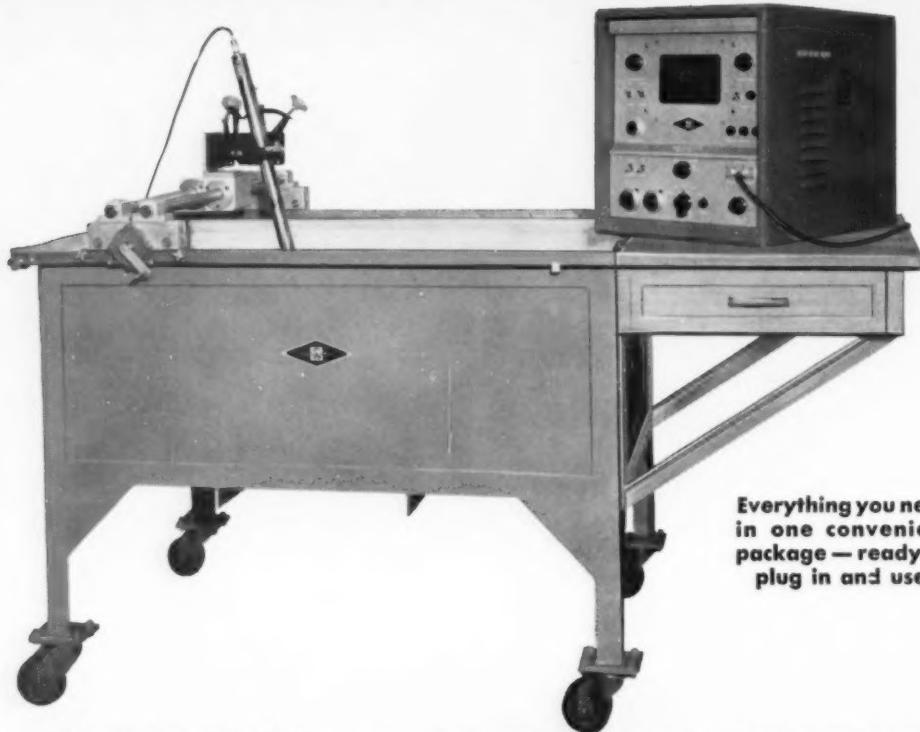


ROEBLING CF

Subsidiary of The Colorado Fuel and Iron Corporation

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO,
5525 W. ROOSEVELT RD. • CINCINNATI, 2340 BLENDALE-MILFORD RD., EVENDALE •
CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT,
915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340
E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. •
PHILADELPHIA, 230 VINE ST. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740
17TH ST. • SEATTLE, 900 1ST AVE. S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321
N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N.Y.

ULTRASONIC INSPECTION



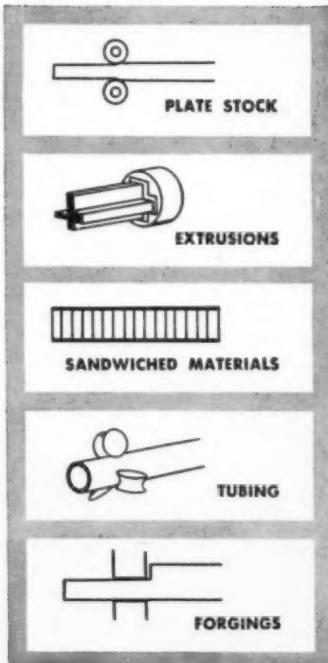
Everything you need
in one convenient
package — ready to
plug in and use.

A COMPLETE, ECONOMICAL PACKAGE for immersed non-destructive testing

Now Curtiss-Wright offers all the benefits of immersion ultrasonic testing of metal without the expense of purchasing an assembly of several costly separate units. This new low cost "package" combines in a self-contained single unit the Immerscope — the heart of the system — a four-foot tank, search tube and rack, precision manual manipulator, longitudinal and transverse manual scanning mechanism and a complement of crystals. Here is a complete immersion testing, quality control installation ready to operate, whether in laboratory or light production — a system that can be readily expanded, with only minor investment, for more demanding production applications.

The technique is simple. Metal parts are immersed in water in the tank. Ultrasound is applied to penetrate the metal. Defects present will reflect the sound. Those echoes are presented as pips on the cathode ray tube of the Immerscope. Flaw detection is precise and positive.

This Ultrasonic Test Unit Model PT 1001 lowers inspection costs, stabilizes high standards in quality control, and permits analysis of fabrication techniques. Complete information on request. Our local representative is available to discuss your problem.



CURTISS-WRIGHT OF CANADA, MONTREAL • CURTISS-WRIGHT EUROPA, AMSTERDAM

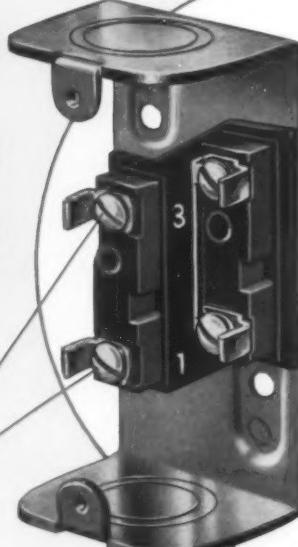
Brand New Idea

in STANDARD-DUTY STATIONS



THE CONTACT MECHANISM
IS IN THE COVER!

THESE
ARE THE
WIRING
TERMINALS!



EASIER
TO WIRE!

No skinned
knuckles

No cramped
wiring
space

Here's an entirely new idea in push button stations—a wrap-around cover—with the contact mechanism part of the cover. Removing the cover exposes the terminals for instant and easy wiring. Strong, spring type, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the terminal blocks assure that the wiring connections are always correctly made. A bakelite shield

protects the contact mechanism and prevents careless wiring from interfering with the contact operation. Concentric knockouts are provided in both top and bottom of the heavy metal base.

You will want to know about this new standard-duty station because—it is good looking—it takes less time to install—it was designed for the convenience of the installation engineer.

Let us show you a sample of this "brand new idea" in standard-duty stations!



ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

Bulletin 800 stand-
ard-duty push
button stations can
be supplied with
one, two, or three
buttons, or as a se-
lector switch. Also
available with pilot
light. Furnished
only in NEMA Type
1 enclosures.



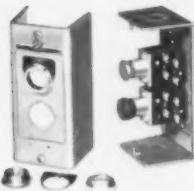
Also...

NEW HEAVY-DUTY PUSH BUTTONS

BULLETIN 800



NEW FLEXIBILITY!



You can assemble any special heavy-duty station from a small stock of standard push button, selector switch, and pilot light components. There is no need to wait for long delivery of your special stations.

Stations can be arranged for either vertical or horizontal mounting. Name plates can be rotated to any position, replaced with any standard marking, or removed entirely.

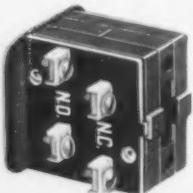


NEW ENCLOSURES!

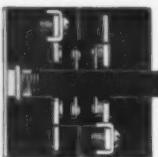
Each button, selector switch, or pilot light is a self-contained unit which can be mounted in attractive new enclosures. Standard enclosures accommodate up to eight units, but enclosures can be furnished for larger numbers.



NEW CONTACT BLOCK!



Bulletin 800 heavy-duty push buttons have the same molded contact blocks that have proved so dependable in Bulletin 800T oiltight push buttons, although they are not themselves oiltight. And all of them are equipped with double break, silver alloy contacts.



Above: View of contact block, showing terminals for normally open and normally closed contacts. Right: Contact block, with cover removed, showing stationary silver alloy contacts and pushrod carrying the moving contacts.

NEW OPERATORS!

Operators, which mount on the contact block, are available in many types, and push buttons come in various colors.



Type AK2B flush head START button



Type DK6A mushroom head button



Type PK16 pilot light with transformer



Type EK11B cylinder lock unit

9-56-MR



ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

Allen-Bradley Co., 1318 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

REPORT TO MANAGEMENT

Don't Get Caught Short

You have been hearing a lot about some of the more scarce materials becoming available in greater quantities. Implication is that you won't have to worry in the months ahead about where your supplies of steel, copper, aluminum, and other materials are coming from.

In many cases, these reports are substantially true. But they tend to be misleading. If you follow this line of thinking too far, you have to run the danger of being caught with your inventories down.

A lot of the increased availability is caused by inventory control in many of the big industries. They are just staying out of the market while their inventories get to be in line with production requirements.

If they come back into the market, a lot of what is available today will disappear from the market tomorrow. So don't get lulled into too much complacency.

Where It's Coming From

Your market reports are filled with examples of less-than-expected buying from automotive. As the weeks pass, this can lead to the idea that Detroit's demands won't be up to original expectations.

The real story about Detroit is still obscure. But it boils down to the same thing. Auto executives, intentionally or unintentionally, are underplaying their hand at the moment. Their predictions about sales of '57s were low. Production schedules were not set at terrific figures and these were beset by difficulties in getting lines rolling. Result is that dealers don't have enough cars on hand in many cases.

Something else to consider: The auto industry may be trying to level out some of the peaks and valleys. If this is so,

indications are that it won't work, that stepped-up production, and purchasing schedules, may be ahead.

The international situation did destroy some of the complacency that many felt about their inventories. This is no time to worry about buying too heavily. It may be too late when you act.

There is no reason to have any doubts about the economic picture in 1957. It always did look good for the first six months. Now a year of full productive effort is assured.

Tax Problems—States Have Them Too All the fiscal headaches in government aren't confined to Washington. You'll find just as many in your state capital. Hard-pressed state officials are having trouble staying out of the red.

Tax difficulties have led 35 states to form special tax study groups in the past three years. According to Herbert J. Miller, executive director of the Tax Foundation, this is "symptomatic of fiscal ills."

States have had to face inflated costs, population increases resulting in increased expenditures for schools and other public facilities, increased welfare costs, and growing highway demands. Their tax bases have not kept pace.

Your problem is to see that any new tax base is equitable, not just laid out to get the most revenue. Some states have lost industries from too-high corporate taxes. Others have discouraged new industries and as a result kept their tax bases from increasing to meet new needs.

Remember, in 1955 states raised more tax rates than in any year since the end of World War II. This trend is going to continue. So keep a careful eye on your state while this is going on.

INDUSTRIAL BRIEFS

Dear Teacher . . . A correspondence course for welding supervision, inspection and design is now made available by the National Technical Training Services, Buffalo, N. Y., for drawing office men and engineers. The course is divided into 16 lessons and takes about 10 months to complete. Throughout the course, exercises are required to be completed and returned for grading. Progress is observed and remedial instruction given.

How to Buy Castings . . . Reliable sources for gray iron castings in every industrial area are now found in the Buyers' Guide and Directory, issued by the Gray Iron Founders' Society, Inc., Cleveland. The book contains foundries listed geographically, data for each member foundry on type and size of castings produced, average monthly production, types of iron produced, special facilities, and executive personnel.

Engineering Center . . . United Engineering Trustees, Inc., has signed a contract for preliminary architectural plans and studies for a new Engineering Center in mid-Manhattan, N. Y. It is expected to make New York the "engineering capital of the world." Funds of several million will be raised with the aid of leading industrialists, scientists, engineers, and educators.

Cash for Ideas . . . The James F. Lincoln Arc Welding Foundation, Cleveland, is offering design competitions for college engineering undergraduates. The foundation is offering \$5,000 in cash awards to students and scholarship designs in which arc welding is used. A total of 46 awards will be made, the highest being \$1,250. Winners and their schools also receive national professional recognition.

Get Ready . . . Contracts totaling approximately \$35 million have been awarded to Raytheon Manufacturing Co., Waltham, Mass., by the Dept. of the Army for further development and production of military equipment. Approximately \$6 million of the total will be used for plant preparation and tooling up.

Stamp Collection . . . Worcester Pressed Steel Co. will give up its 47-year-old steel rolling activities in order to make way for increased stamping business. All rolling mill equipment has been sold to the Rome Strip Steel Co., Rome, N. Y. The building that housed the steel rolling machinery will now have new blanking presses required by the current demand for stampings.

Fearless Fosdick . . . The R. K. LeBlond Machine Tool Co. has purchased The Fosdick Machine Tool Co., Cincinnati, O. The acquisition was made to diversify an expanding metalworking market, whereby both firms will continue to do business independently. Fosdick manufactures drilling precision jig borings and grinding equipment and employs 200 people; LeBlond, 1,100.

Plenty of Room . . . The George L. Nankervis Co. is now occupying its new multi-million dollar facility designed to accommodate its own manufacturing operations and those of its recently acquired subsidiary, the Commercial Research Division in Detroit.

Bridge Club . . . A seminar sponsored by the Lincoln Electric Co. met in Cleveland to discuss the use of welding in bridge design, fabrication and construction. The meeting was to aid designers and fabricators in developing efficient bridge designs in welded steel.

Deep Drilling . . . A new \$12 million drill manufacturing plant will be built near Richmond, Ind., by Bucyrus-Erie Co. for the manufacture of drilling machines. The acreage for the plant has been acquired and test drilling completed. Completion is scheduled for late 1957 or early 1958. The plant will employ about 1000 people.

Froil Foils . . . Froil, a corrosion-protective oil, developed and manufactured by Octagon Process, Inc., Staten Island, N. Y., offers the user three-way corrosion protection: a moisture and vapor-proof barrier against corrosion, water displacing properties and fingerprint removal.



Pastushin's Clip-It—A new product—the punched spring steel clip that costs pennies—can save dollars in work time.

Available in all sizes to fit clamp attachment bolts. Clip-It does the work while you have your hands free to tighten the bolt in those "hard to reach places." Write today for Clip-It samples and quantity prices. New—Exclusive

*Patent Pending
PASTUSHIN INDUSTRIES INC.
5651 WEST CENTURY BLVD., LOS ANGELES, CALIFORNIA
Developers and Manufacturers of Aircraft Fasteners

GOOD EXAMPLE

of the special machine tools Consolidated can build for you

30 feet high and weighing 140 tons, this Betts 100" worm-and-rack-driven slotter was built for one of the country's leading manufacturers of electrical equipment.

The ram is driven by a variable-voltage, adjustable-speed, direct-current motor. The table, in addition to cross, longitudinal and circular feed, and traverse movements by means of separate variable-voltage motor, has an electrically controlled indexing device. Ram guide and ram stroke adjustment are also electrically controlled.

Next time you're in the market for precision metal-working equipment remember this huge slotter . . . and remember the company that built it. Consolidated has produced more types of machine tools than any other company in the United States.

Detailed information on any of the products listed will be sent on request.

CONSOLIDATED MACHINE TOOL DIVISION

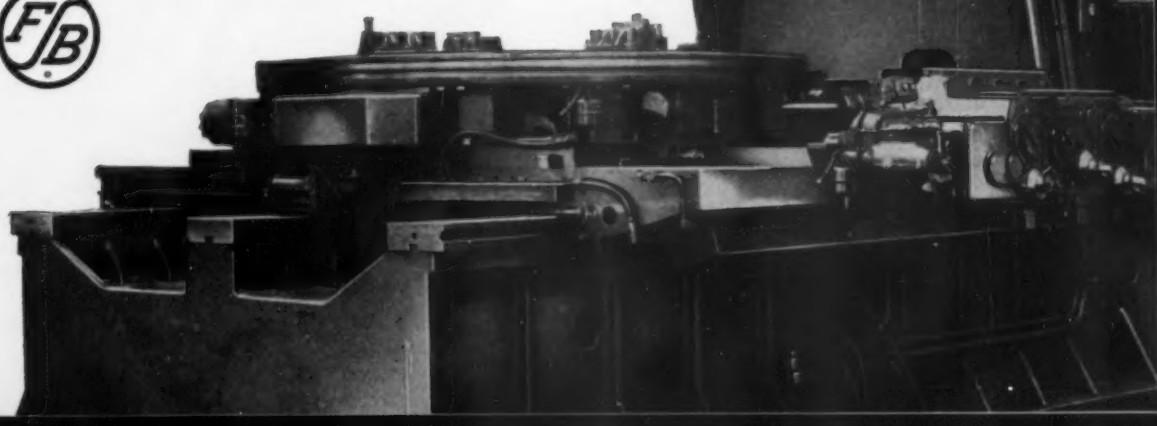
Farrel-Birmingham Company, Inc.

Rochester 10, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

CONSOLIDATED MACHINE TOOLS

Engine Lathes • Vertical boring and turning mills • Floor and planer-type horizontals • Planers, double housing and openside • Planer-type milling machines • Plate edge planers • Vertical slotters • Rotary and straight-line production-type milling machines • Skin mills for aircraft manufacturing • Circular cold saws • Railroad wheel and axle machinery • Special machine tools.





Parts Makers Go For Growing Markets

Keeping up with the auto industry is a hazardous business for parts makers... They seek diversification for survival... One big maker's products range from spark plugs to paper goods—By T. L. Carry.

♦ THE AUTOMOTIVE PARTS business is so closely allied with the parent industry that relatively few people realize its importance.

The two businesses go hand in hand. If the outlook for new car sales is good, the outlook for parts suppliers is equally good and sometimes better. Parts are used not only as original equipment, but as replacements. And the replacement market is tremendous.

It is in this field where parts suppliers contribute so greatly to the nation's economy. They are a boon to the small business man, independent warehouses, garages and gasoline stations.

Profits Hard-Earned... But the business of making automotive parts is loaded with pitfalls. A vendor can be up in the clouds one day and flat on his face the next. He can price himself out of a market; or a car for which he makes parts may not go over with the public. His business will suffer a corresponding lag. It's a constant struggle.

As cars improve, the vendor must keep pace with advancements in the industry, not only in product quality but also in methods of production.

In addition, it's becoming more obvious that it is not smart to put all your eggs in one basket. The more diversified a supplier company is, the better its chances of survival.

Lessons Hard-Learned... There are three things a parts company must do today, if it

hopes to stay alive. It must be competitive; it can't overlook the replacement market and it has to diversify as much as possible.

AC Spark Plug Div. of General Motors is a good example of how to do these things.

Two-thirds of AC's business is done outside of GM. One-third is in the replacement market and the other third defense contracts.

The division is widely diversified. Its products range from spark plugs, oil filters, instrument panels and gas gages to paper products and ceramics.

It also produces gyroscopes and electronics systems for guided missiles.

AC has managed to keep up

with the auto industry in production methods. The use of transfer presses in a lot of operations and the integration of assembly line procedures has helped cut down plant inventories to a considerable extent.

Looking For Markets... Automatic handling has also improved the quality of products. Raw materials, in order to be used in automatic machines, must meet more rigid specifications. Thus, the quality of the end product is also better.

In addition, new production methods have increased employment at the division. The ability to make more products cheaper calls for more manpower. Workers have been upgraded and advanced to higher jobs. The division's employment rolls since 1946 have nearly doubled from about 9,000 to 18,000 workers.

At the same time, the division is not resting on its laurels. As J. A. Anderson, division manager, puts it, "AC has one of the most diversified engineering and production jobs in the automotive industry. We are looking years ahead with an eye to putting electronics on every car. We're interested in air power and atomic power. We are always trying to develop new and better parts and accessories."

As an example of a new product being brought out this year, Mr. Anderson mentioned the division's speed warning device available on the 1957 Buick. With this device, the motorist can set a dial for a given speed limit. When the speed



"Never mind about the motor! What do you think of flamingo red seats, set against pale Bermuda sand back rests, with meadow mist green interior door paneling in nylon brocade?"



How Great Lakes Steel charts quality



Left: Thermocouple is inserted into an open-hearth furnace to check temperature of heat. Right: Multiple indicator records open-hearth temperature.



This view shows 12 of Great Lakes 17 open-hearth furnaces.

Bright spots are furnaces being charged with pig iron and scrap. The open-hearth process takes from 10 to 12 hours.



This is the business end of a thermocouple, the rugged yet delicately accurate device that measures temperature in an open-hearth furnace. The two fine wires you see above, inside the casing, absorb heat and transmit it as an electrical current to be charted by recording potentiometers.

No chance for guesswork here—through eleven long hours the rising temperature of what will be 500 tons of Great Lakes open-hearth steel is meticulously controlled. Then, at exactly the right time and the right temperature, the glowing molten metal gushes into ladles for pouring into ingots.

The slender, spidery lines on the chart assure another heat of high and uniform quality steel. Quality that is checked and rechecked at every step to assure that customer specifications are met precisely.

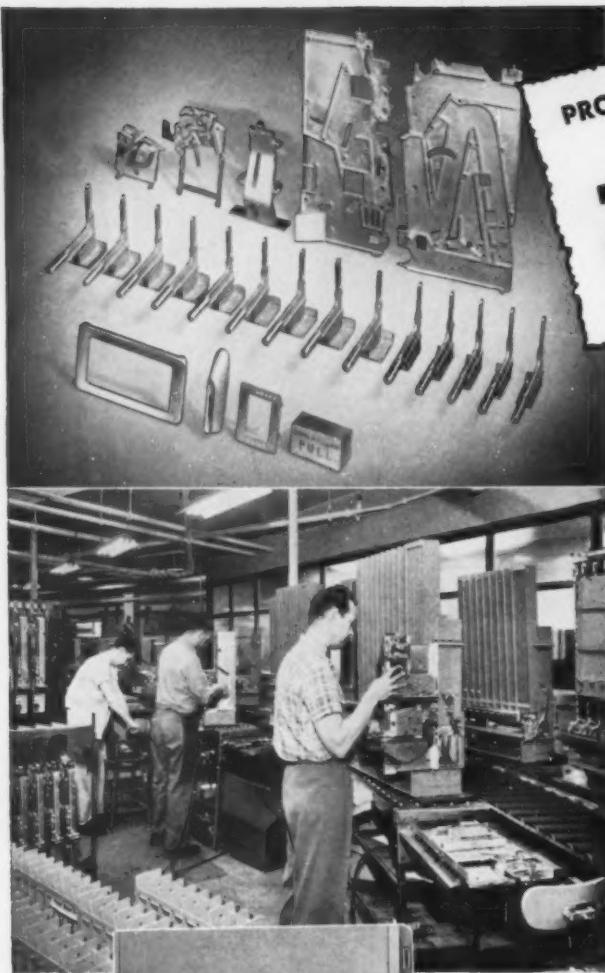
Why don't we get together and talk over your steel needs? Some time soon?

GREAT LAKES STEEL CORPORATION

Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.



PRODUCTION SHORT CUTS
WITH
ZINC
DIE CASTINGS

NUMBER 3
OF A SERIES

MAKING
THE SALE
FOR . . .

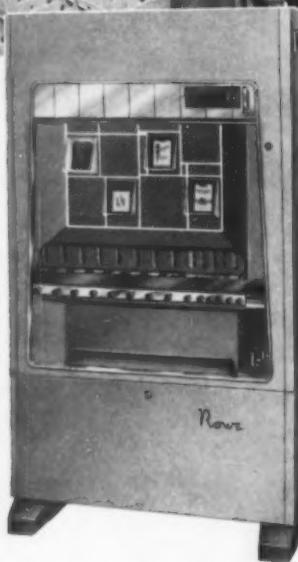
Rowe®

When you make a purchase from the familiar Rowe Ambassador cigarette machine, the coins are handled almost completely by a series of intricately shaped ZINC Die Castings. A die cast plunger then delivers the package you select. The efficiency with which this mechanical business transaction takes place is the result of expert engineering which has made Rowe "America's First Automatic Merchandising Family."

These are the outstanding production advantages provided by the use of ZINC Die Castings for the vital cigarette machine components:

1. Avoidance of expensive machining—the castings are virtually ready for assembly as received from the die caster.
2. Minimizing of assembly operations—unusual complexity of shape makes one part serve in place of several if produced by other means.
3. Assurance of trouble-free operation through sturdy construction and close dimensional control of all castings in long production runs.
4. Ability to take and hold economical and attractive plated coatings (external castings only, internal parts are used "as is").

The continuous use of ZINC Die Castings by Rowe Manufacturing Company, Inc. through many machine design improvements, over a long period of years, is a tribute to the fine performance of such parts under rough everyday operation. For possible answers to your production problems through the use of ZINC Die Castings, send for our brochure and contact any commercial die casting company.



ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
NOV. 17, 1956	151,269	24,262
NOV. 10, 1956	139,332	22,799
NOV. 19, 1955	185,359	28,109
NOV. 12, 1955	186,146	29,075
TO DATE 1956	5,271,043	1,068,361
TO DATE 1955	7,350,502	1,179,059

*Estimated. Source: Ward's Reports

is reached a buzzer sounds warning the driver how fast he is going.

Another field which is opening up for the division is printed electrical circuits. These are being used for the first time in the industry on the 1957 Oldsmobile instrument cluster.

In the field of things to come, it is possible that soon cars will be equipped with electronic speedometers. Perhaps it will be possible to eliminate the dip stick in an auto engine and you will be informed electronically when your motor needs oil. Another possibility is an electronic device which will show you the water level in your car radiator.

The possibilities are unlimited and parts makers are exploring many of them.

Sales:

Ford shows improvement in third quarter.

The Ford Div. of Ford Motor Co. increased its market penetration more than any other automaker during the third quarter this year. Sales, according to *Automotive News*, were up 1.08 pct. Penetration for the first 9 months this year was 22.63 pct. Actual cars sold were 1,010,736.

The division still has a long way to go before it can come close to Chevrolet. Chevy's market penetration for the same period is 26.50 pct or 1,209,036 cars. That's slightly over 198,000 units better than Ford.

Buick continues to lead Plymouth with a registration of 431,130 cars compared to Plymouth's 377,632. Oldsmobile is right behind Plymouth with 350,495.

Industry observers are keeping a closer eye on the market now that all the new cars have been introduced. The question is, are any of the makes going to change places in 1957?

Ford is after Chevrolet; Plymouth wants third place back and Oldsmobile is eyeing fourth place.

Nobody knows how it will turn out at this stage, but it's possible to make one prediction. The fight for position next year is going to be a knock down, drag out affair.

All producers report wide public acceptance of their new models. Production schedules have been stepped up to meet what the factories call "an increasing demand" but what might be, in some cases, an attempt to make up lost production.

AUTOMOTIVE NEWS

U. S. will divert more nickel from its strategic stockpile.

With this in mind, Sharon Steel Corp., one of the country's largest stainless producers, expanded its Dearborn, Mich. Div. which will increase stainless capacity by 25 pct.

David B. Carson, executive vice president, says the new installation puts Sharon closer to its market. The company is a major supplier of stainless for the automotive industry.

Mr. Carson can see the day when stainless will be used for such things as radiators and mufflers on cars.

Stainless: Automotive use will be up in 1957.

Predictions are that the auto industry's use of stainless steel will increase 10 to 12 pct in 1957.

Wider application of the metal is expected because it is hoped the

It's the "Edsel"

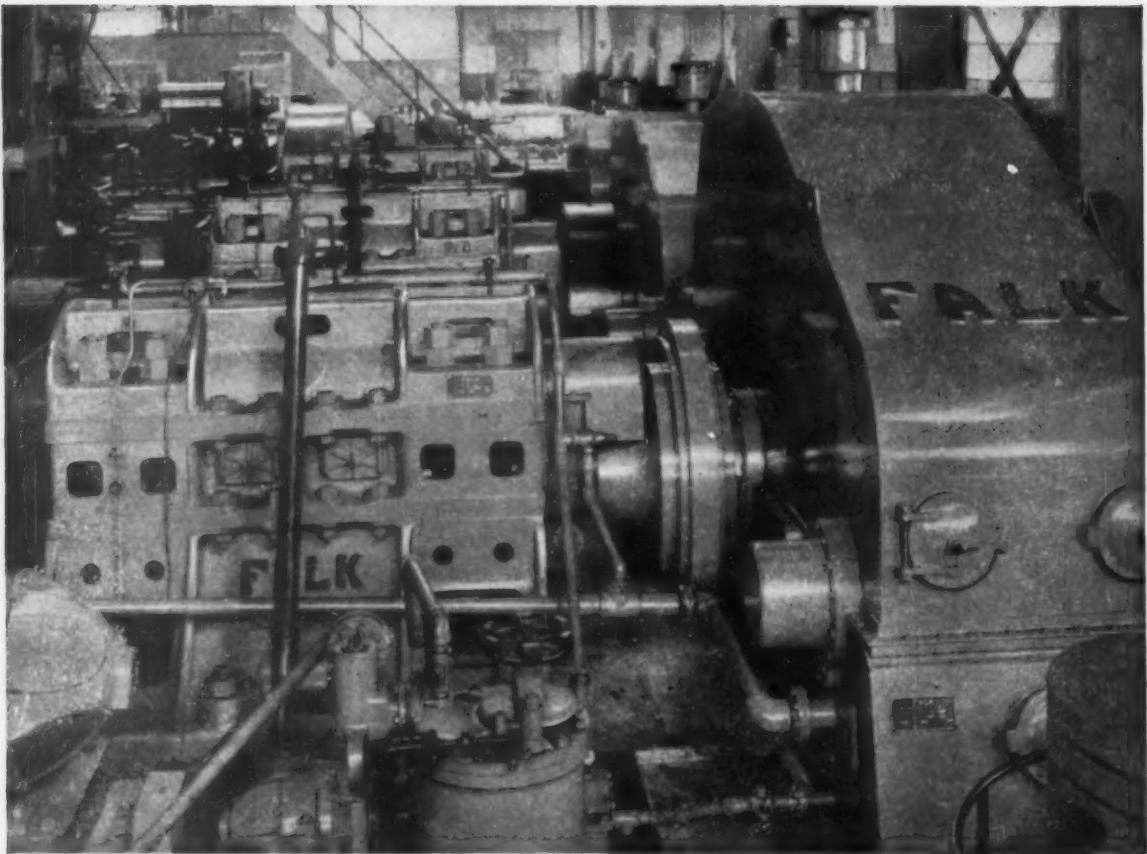
Speculation regarding the name of the new car to be introduced by Ford next year has ended. It will be called the "Edsel," after the late son of Henry Ford.

The former Special Products Div. is now the Edsel Div. and takes over the offices of the Continental Div., now merged with Lincoln.

THE BULL OF THE WOODS

By J. R. Williams





Better protection under pressure

EVEN UNDER SHOCK loads and prolonged heavy duty service, *Texaco Meropa Lubricant* keeps reduction gears and bearings running smoothly, on the job longer. Here's why:

Texaco Meropa Lubricant contains special EP properties that toughen its lubricating film, extend its effective protection far beyond normal requirements. And the polar additives in *Texaco Meropa Lubricant* enable it to adhere to metal under all conditions.

Texaco Meropa Lubricant resists thickening under heat, will not foam. It remains stable in

use, storage or centrifuging—is non-corrosive to all gear and bearing metals.

For roll stand circulating systems, use *Texaco Regal Oil*. This turbine-grade oil keeps systems clean, resists oxidation and sludging, assures full protection for oil film bearings.

Contact a Texaco Lubrication Engineer soon and put these cost-savers to work in your mill. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO **Meropa Lubricants**
FOR STEEL MILL GEAR DRIVES



WHY FRB Continues Tight Money Policy

Board believes inflation still a real danger, will continue its tight money policies six to eight months . . . Policies have not restrained borrowing . . . Administration will keep credit brakes—By G. H. Baker.

- HIGH-PRICED bank credit is here to stay for another six to eight months.

The credit restraints clamped on by the Federal Reserve Board in recent weeks are not going to be eased any time soon. Inflation still is a real danger, as the Reserve Board sees it. And earlier plans to slacken up on borrowing terms around the first of the new year have been suspended.

The money experts in Washington are surprised that borrowing of funds hasn't slowed. Business firms and consumers alike are still lining up at banks and lending institutions to borrow money—and at higher rates.

No Letup . . . Expansion programs, both at the industrial level and the household level, are still breezing along.

As a result, the Administration intends to keep a fairly heavy foot on the credit brakes until well into the second quarter of next year.

At the Federal Reserve Board, the money experts will tell you that the currently tight credit policy is necessary to prevent the smouldering ashes of inflation from bursting into a runaway bonfire. Right or wrong, the Reserve Board is due credit for having the guts to take this politically unpopular position and to stick to it. A "hard money" policy is always unpopular with borrowers. It's much easier to pursue a "soft money" course, to allow an abundance of money to circulate and to ignore the resulting price rise.

Can Get Loans . . . The Reserve Board is receiving plenty of criti-

cism and complaints from businessmen over the high price of borrowing money.

Banks are looking sharply at loan applications and are turning down some. But the government-operated Small Business Administration is taking up this slack. SBA lending has increased considerably in recent weeks, and businessmen who need money for expansion or for working capital are finding that SBA regional offices aren't nearly as fussy as banks when it comes to loans.

Too Much Security?

The basic trouble with the Pentagon's system of military censorship is that the hierarchy is trying to classify as "secret" or "confidential" far too much information. The Defense Dept. is told by a committee of businessmen.

The committee, headed by Charles A. Coolidge (Boston attor-

ney and former Assistant Secretary of Defense), tells the Defense Department that its entire censorship program is likely to remain in trouble as long as it tries to take in too much territory.

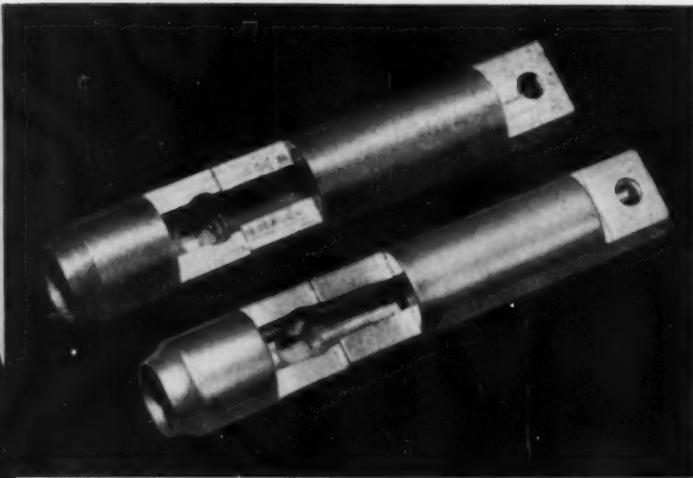
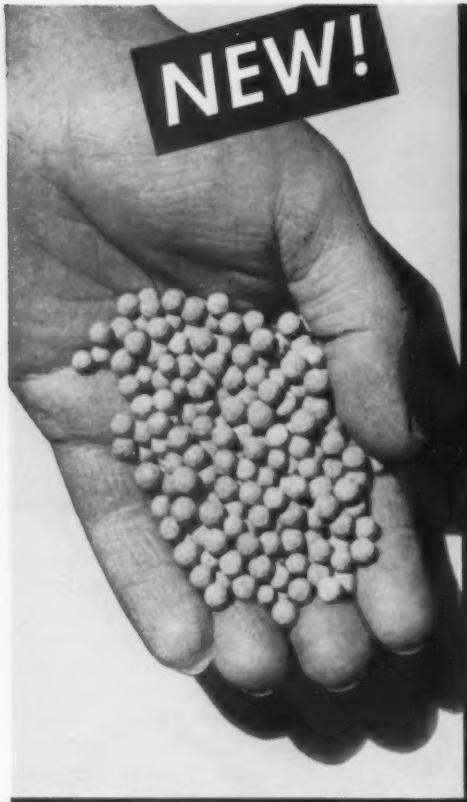
Committee members are telling Defense Secretary Wilson that too many Pentagon officials—both military and civilian—are rubber-stamping SECRET or CONFIDENTIAL on the papers that cross their desks. There's no real military security involved in more than half of these projects. But nobody at the Pentagon seems to know how to reverse the trend.

More and more, it is becoming evident that the Pentagon's censorship network has become top heavy, and may have to be cut down to size by the Congress. The Eisenhower Administration, ever sensitive to criticism and quick to correct its mistakes, is becoming increasingly embarrassed.

Ike Puts Needle To Antitrust Loopholes

• The Eisenhower Administration in 1957 will again push for congressional approval of a three-point antitrust program. Chief trust-buster Victor R. Hansen will ask lawmakers to:

- 1) Approve the controversial pre-merger notification bill. It would require firms to notify the Justice Dept. of their intention to combine within a minimum of time.**
- 2) Allow the U. S. to compel firms under investigation in a civil suit to produce their records. The Department now is severely handicapped by lack of authority to collect evidence in civil cases.**
- 3) Permit the U. S. to act against bank mergers carried out by asset acquisition. Under present laws, the Department may only control mergers which involve stock.**



The new ALUNDUM Tumblex "S" abrasive rolls around and through intricate parts; brings high uniformity of radii and surfaces, with smooth finish, to the barrel-finishing of parts as intricate as this gun component. The "before and after" view shows you how the spheres improve external and internal areas.

Besides this $\frac{3}{16}$ " diameter size of Tumblex "S" you can order it in four other sizes, up to $\frac{3}{8}$ ". This means top barrel-finishing performance for you, in many different applications. And these new spheres are exceptionally dense and long-lasting.

Another big advance in barrel-finishing Norton Tumblex "S" abrasive spheres

From the pioneer of ALUNDUM* bonded triangles — now,
new bonded spheres to help you do a better job

If you finish parts that have hard-to-contact recesses or intricate shapes, Tumblex "S" tumbling abrasive is the latest development.

Here are the logical reasons why tubing, coil springs, scissor handles, bearing retainers, pump bodies and many other parts benefit by the new shapes and sizes of Tumblex "S" — and by its top-quality as a tumbling abrasive.

- Tumblex "S" is made in spheres that easily get into areas where other abrasive shapes can't reach.
- It comes in five different diameter sizes. #2, $\frac{3}{8}$ "; #3, $\frac{5}{16}$ "; #4, $\frac{3}{8}$ "; #5, $\frac{5}{16}$ " and #6, $\frac{3}{4}$ ", covering a big range

of parts to be barrel-finished.

- Made of famous Norton ALUNDUM abrasive, it cuts fast — resulting in shorter time cycles and lower costs per piece finished.

Send Your Work Samples

Let us demonstrate in our newly enlarged Sample Processing Department how Tumblex "S" Abrasive can give the value-adding "Touch of Gold" to your product quality and cut your barrel-finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow

pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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WEST COAST REPORT

Metals Will Share Construction Boom

Voters approve \$1 billion in new bond issues for heavy building programs . . . Projects, requiring large amounts of metal, mean more business for steel, aluminum producers, metal fabricators—By R. R. Kay.

♦ FARWESTERNERS have voted themselves into another wave of big spending. Bond issues for \$1 billion in construction projects—the kind that swallow huge amounts of metal—got an overwhelming yes from the people in the recent elections.

Marketing men in metalworking plants around the country had better upgrade their West Coast quotas—with the accent on California.

What's Going Up . . . When the projects get rolling, there will be even bigger demands on steel and aluminum producers; makers of construction equipment; and manufacturers of metal products.

Here are some of the projects approved: Californians will spend \$300 million for more school buildings and state institutions; \$500 million in loans for veterans to buy homes and farms. San Francisco alone will put \$27 million into school building. And \$25 million will go to expand its International Airport for jet airliners.

Seattle has voted \$25 million for new schools and \$8.5 million for a civic center and park improvements. Los Angeles gave the go-ahead for over \$30 million for public works.

Present is Pleasant . . . Another banner year for engineering construction work in the 11 Western States seems assured. Contract awards for the first nine months of this year reached over \$3.5 billion. That's almost \$1 billion more than the same period 1955.

The work is on airports, power plants, dams, water works, pipelines, sewage systems, highways, streets, and bridges.

West Coast Briefs

Kaiser Aluminum & Chemical Corp., Oakland, Calif., plans to build a three-pot-line aluminum reduction plant in Douglas County, Wash. It would be ready by 1961. However, much depends on whether a \$110 million Columbia River dam and hydro-electric project goes in at Wells Dam Site.

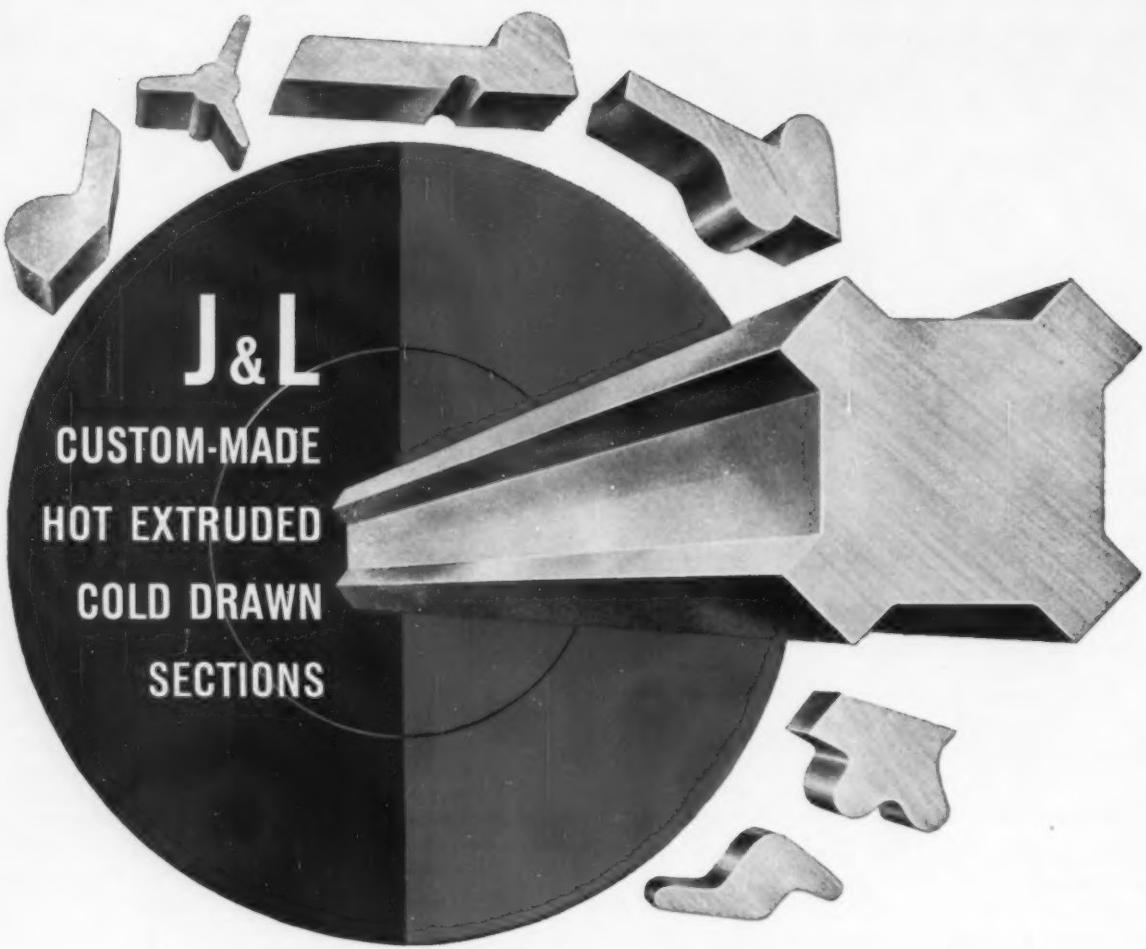
Parr Industrial Corp., San Francisco, will put up a \$5 mil-

lion plant in Seattle for production of jet plane parts by Boeing.

It appears Seattle's Boeing intends to also expand south, into California. Company has an option to buy the multimillion-dollar former Ford Motor Co. assembly plant at Richmond in the San Francisco Bay Area. If Boeing buys it, it will probably become the assembly site of its Bomarc guided missile, a long-range ground-to-air pilotless interceptor. This would end long speculation about the plant's site. Some contenders for the 15,000-employee plant: Denver, Colo.; Salt Lake City, Utah; Wichita, Kan.



SEVEN's the point at Northrup Aircraft Inc., Hawthorne, Calif. The Drivematic riveter automatically drives seven fuel-tight slug rivets into a wing section every minute. No further work is required on the joints.



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Builders Priming For M-Day Signal

If the warm war turns hot, U. S. machine makers are ready to start a huge tool-building program . . . ODM sets a six-month goal for general purpose equipment . . . Heavy tools plan uncertain—By E. J. Egan, Jr.

• BECAUSE of the tense situation in Egypt and Hungary, machine tool builders are keeping close watch on Washington. They're ready if the Office of Defense Mobilization should decide to pull the trigger on its \$256 million M-Day Machine Tool Pool Order Program.

Builders hope this won't happen. But if the signal does come from ODM, 81 of them will immediately drop everything they're doing to give their trigger contracts 100 pct attention. The goal: to build approximately 15,500 general purpose machine tools in 6 months or less.

Big Tool Dilemma . . . Thus, in the matter of standard metalworking machines at least, the nation's M-Day plan is geared for a flying start.

Unfortunately, this isn't true when it comes to the big, so-called "elephant" machine tools that take a year or two to build. Need for more of these to carry out a full-scale mobilization effort is clear to top defense planners, builders and users alike.

Only trouble is that Washington can't decide what types of "elephants" it needs and how many of each. Nor is there a clear idea of what a program like this should cost.

Polltakers In Action . . . To get logical answers to these questions, defense officials periodically take another "survey." This has been going on for several years. Now comes word that the Metalworking Equipment of the Business &

Defense Services Administration will soon poll elephant tool builders and users again.

Hope is that this tally, weighed against Defense Dept.'s estimated needs, might be conclusive enough to stop all the talking and start some action. BDSA says it will make recommendations early next year. If the "luke warm" war is hotter by that time, maybe they'll be accepted.

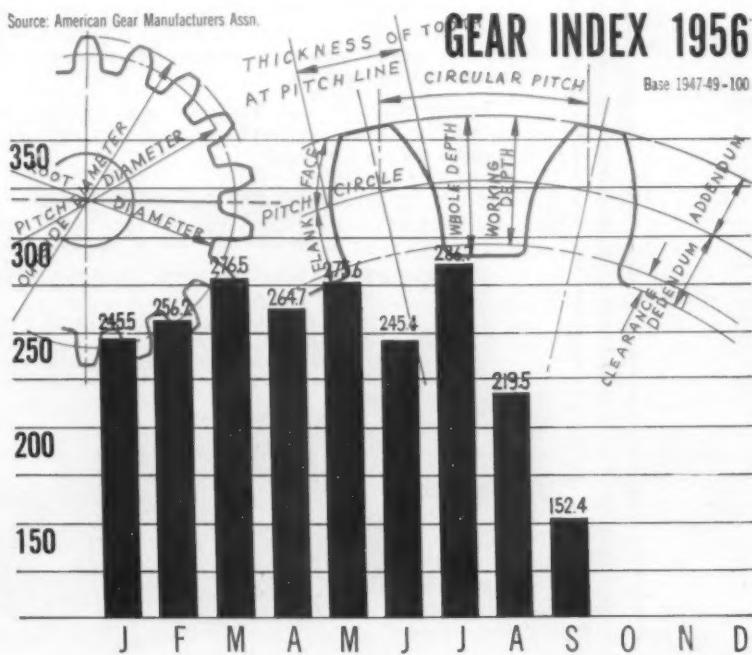
Replace The Obsolete . . . Uncertainty about the present world crisis could also put more zip in another government machine tool program. This is the Defense Dept.'s new plan (THE IRON AGE, Oct. 11, p. 81) for replacing older

machine tools on military production lines with more modern types.

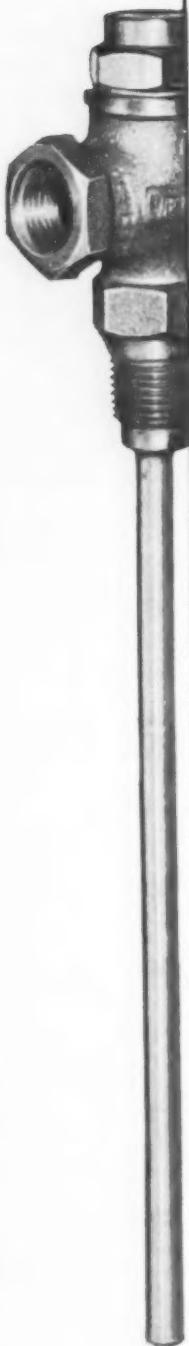
Plan hinges on getting money from Congress so that each armed service can buy a batch of new tools every year. It's supposed to start next July 1, when the 1958 fiscal year begins. Originally, the annual sum requested was to be kept within 2 to 5 pct of the cost price of the tools listed in various Defense Dept. inventories. Latest word is that this range has been boosted to 8 pct.

There's always a chance that a program like this could bog down. Congress could simply refuse to pony up all or even part of the money. But it doesn't seem likely now under present conditions.

Source: American Gear Manufacturers Assn.



Welsbach High Pressure
Service Gas Valve with
Revere Arsenical
Bronze Stem.



REVERE

Deep-Drilling Brass Rod

Increases Tool Life over
200% for Welsbach
Why not try it yourself?

In the manufacture of valves the Kitson Division of The Welsbach Corporation, Philadelphia, Pa., has to deep-drill brass rod. Originally the rod was free-machining brass. However, when Revere discovered the extent of the drilling it was suggested that our Mixture 252, Deep-Drilling Brass, would be preferable. This was tried, and the machine shop foreman reported that tool life was increased over 200%. In one item it is possible to bore with a single operation, against the former practice of withdrawing the drill three times in order to clear the chips. Revere's Deep-Drilling brass produces very small, easily cleared chips.

Another item is a high pressure gas valve, with a cast body and brass rod stem. The rod was changed to arsenical bronze, which costs a bit more, but it ended flaking and galling between stem and seat, and materially reduced rejects. Still another instance of Revere service concerns a hot water heater relief valve. The original model was cut out of bar stock. We suggested a high leaded brass tube, hexagon outside, round inside. This greatly reduces machining, has a better surface, and a better seat. Costs more by the pound, but saves more by the piece.

Revere salesmen and Technical Advisors are always glad to collaborate in seeking ways to save money and improve products. Perhaps we can help you!

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Shut-Off Valve, automatic.



The Iron Age

SALUTES

William H. Doerfner As general manager of Saginaw Steering Gear Div., General Motors Corp., he showed industry how to mass produce a vital military weapon; has aided in developing new alloys and a permanent molding process.

Sometimes the plaudits are late coming, but in William H. Doerfner's case, they are never too late to be timely. Just about every taxpayer, and a lot of World War II veterans, owe him a word of thanks. The same goes for many who have purchased General Motors cars — because Mr. Doerfner has saved them all money. Among the veterans, he indirectly may have saved some lives.

As general manager of the Saginaw Steering Gear Div. of General Motors Corp., he showed industry how to mass-produce machine guns in 1941. A grim production job, perhaps, but all-important to front-line soldiers and to taxpayers. By improving methods, he succeeded in reducing costs of such weapons from \$500 to \$50 each. During the war years, the Army-Navy "E" was awarded three times to his division.

Before that, while with Harrison Radiator Div., he helped develop a permanent molding technique that reduced costs of automobile radia-

tors. And throughout his career, Mr. Doerfner has been consistently active in developing new alloys for industrial uses.

A native of Saginaw, Mich., he came up the hard way—beginning in 1917 as a clerk at the Valley Sweets Co. in Saginaw. Most of his technical education was obtained on a catch-as-catch-can basis through night and correspondence school courses. Using borrowed text books, he was able to pass the examination for an engineer's certificate.

In 1919, Mr. Doerfner joined GM as a time-keeper at the Malleable Iron Foundry in Saginaw. His rise into the executive ranks began five years later when he was appointed assistant superintendent of Harrison Radiator Div.

We are still paying for World War II, of course, but we would probably be paying more if it weren't for cost-conscious production men like William Doerfner.

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Plants at Lima and Springfield, Ohio



PERSONNEL



R. J. LINDSEY, elected vice president, engineering, The Hydraulic Press Mfg. Co., Mount Gilead, O.

The Iron Age INTRODUCES

Raymond B. Kropf, elected president, Kropf Forge Co., Chicago; **Victor Brown**, elected executive vice president; **John H. Nelson**, elected vice president; **Raymond T. O'Keefe, Jr.**, elected executive vice president and treasurer.

George T. Fox, elected president and executive officer, Reynolds Manufacturing Co., Springfield, Mo.

Harry L. Quinn, elected president, Donegal Steel Foundry Co., Marietta, Pa.

David W. Rice, elected president, Denver Engineering Sales Co., Denver, Colo.

Carl E. Rowe, elected vice president and general manager, Milwaukee Valve Co., Milwaukee.

Sal Compodonicco, elected vice president, Allen-Stevens Corp., Woodside, N. Y.

Edward C. Elano, named asst. to vice president, Boston district, Westinghouse Electric Co.; **Paul B. Shirling**, named asst. manager, Boston district.

Lawton Howell, named general supervisor, mill accounting, Crucible Steel Co. of America, Pittsburgh; **Edward J. Welsh**, named works controller, Sanderson-Halcomb Works, Syracuse, N. Y.

P. G. Smith, named asst. to president, Roylyn Inc., Glendale, Calif.

D. N. Taylor, named secretary-treasurer, Pastushin Aviation Corp., Los Angeles, Calif.

John M. Tome, appointed director, market research and product planning, Chemical Materials Dept., General Electric Co., Pittsfield, Mass.

John H. Gerber, appointed service manager, north central region, Allis-Chalmers Industries Group.

Warren E. Milner, named manager, Milwaukee plants, AC Spark Plug Div., General Motors, Flint, Mich.

Theodore E. Padkins, named works manager, Scullin Steel Co., St. Louis, Mo.

Lloyd G. Depner, named asst. manager, Cleveland district sales, American Steel & Wire Div., U. S. Steel Corp.

E. F. Meier, named technical asst. to general manager, Glascole Products, Inc., Cleveland, subsidiary of Milwaukee's A. O. Smith Corp.

J. C. de Graaf, named sales manager, Coatings Div., Furane Plastics, Inc., Los Angeles, Calif.



E. L. OEHLING, named general sales manager, The Hydraulic Press Mfg. Co., Mount Gilead, O.



ROGER J. CESVET, named head, research and development work, Building Products Div., The American Welding and Manufacturing Co., Warren and Niles, O.



E. CLYDE GRIMM, elected executive vice president, Samuel G. Keywell Co., Inc., Detroit.

PERSONNEL

Robert C. Gockel, named comptroller, ball and bearing plants, Industrial Tectonics, Inc., Ann Arbor, Mich., and Compton, Calif.

Dr. Robert J. Rohr, named mid-west regional sales manager, Magnus Chemical Co., Inc., Garwood, N. J.

Ralph G. Greer, named asst. sales manager, Construction Equipment Div., International Harvester Co., Chicago; **C. E. Jones**, named supervisor, national contractors' sales.

C. Kirk Garrett, appointed district manager, Atlanta, Ga., office, Spang-Chalfant Div., The National Supply Co., Pittsburgh.

James H. Broderick, named sales manager, The Geometric Tool Co., Div. of Greenfield Tap and Die Corp.

Edward G. Belden, named sales engineer, Robert H. Newton Co., Cleveland.

W. D. Nixon, named purchasing agent, Lubricating Equipment and Air Tool Divisions, The Aro Equipment Corp., Bryan, O.

Alden R. Ludlow, Jr., named director, sales, U. S. Industrial Chemicals Co., Div. of National Distillers Products Co., New York.

Anthony Grosso, named senior engineer, Mechanical Engineering Dept., The United States Testing Co., Hoboken, N. J.

Frank H. Brown, appointed manager, production planning and material control, Stamping Div., Chrysler Corp., Detroit.

Donald J. Hartman, named asst. plant manager, Solar Steel Corp., Cleveland; **Elmer Froehlich, Jr.**, named asst. sales manager, flat-rolled products plant, River Rouge, Mich.

Richard E. Hoppe, Jr., named director, employee training, Minneapolis-Honeywell Regulator Co.



SAMUEL C. CLARKE, named manager, sales, Chambersburg Engineering Co., Chambersburg, Pa.



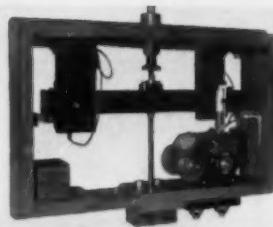
EDWARD H. JACOBS, appointed works manager, Abrasive Machine Tool Co., East Providence, R. I.



E. E. REIMER, elected to the board of directors, Dresser Industries, Inc., Dallas, Tex.



E. E. McKEEN, named general erecting manager, American Bridge Div., U. S. Steel Corp., Pittsburgh.



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Georgia Iron Works, Augusta, Ga.

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Palmyra Foundry Co., Inc., Palmyra, N. J.

The Henry Perkins Co., Bridgewater, Mass.

Pohlman Foundry Co., Inc., Buffalo, N. Y.

Rosedale Foundry & Machine Co., Pittsburgh, Pa.

Ross-Meehan Foundries, Chattanooga, Tenn.

Shenango-Penn Mold Co., Dover, Ohio

Sonith Industries, Inc., Indianapolis, Ind.

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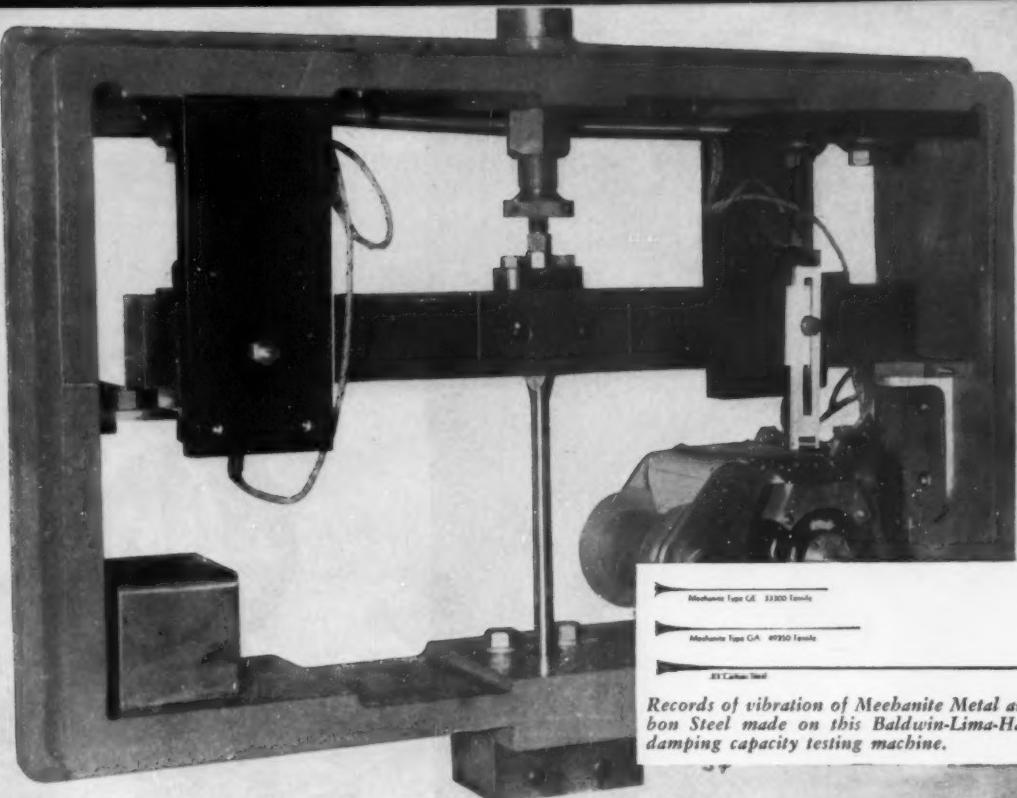
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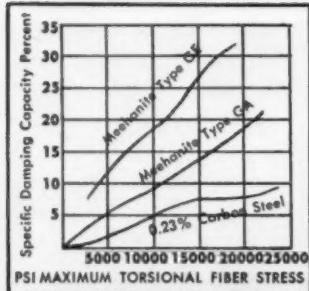
MEEHANITE®

THE IRON AGE



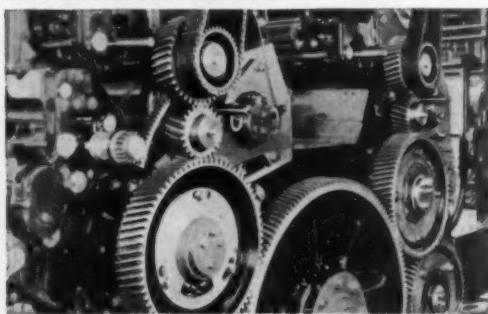
Records of vibration of Meehanite Metal and Carbon Steel made on this Baldwin-Lima-Hamilton damping capacity testing machine.

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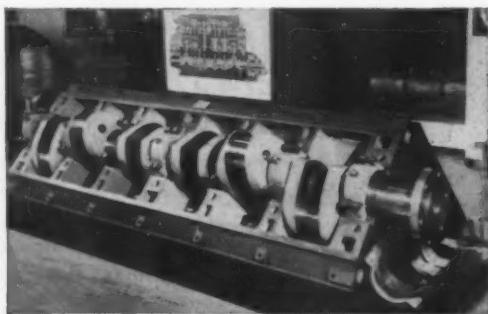


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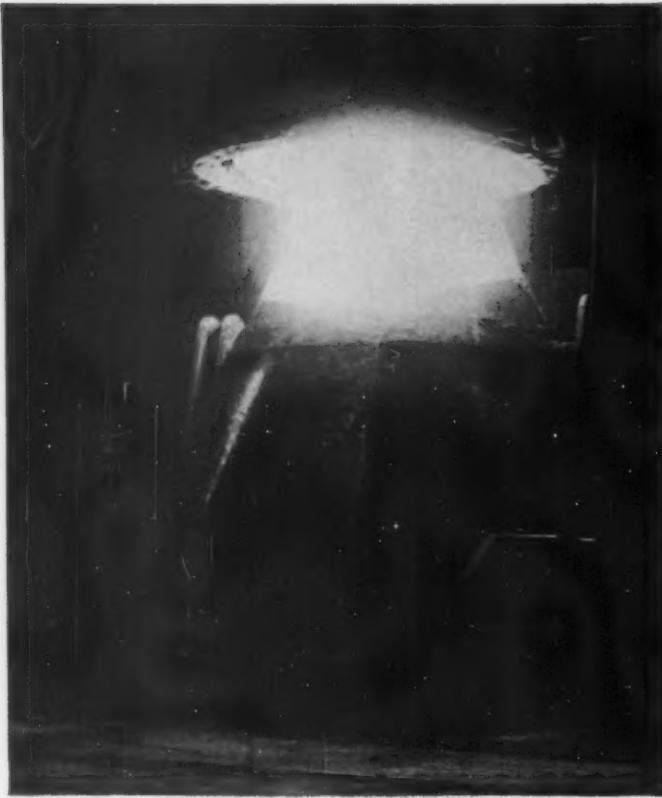
Meehanite chain of gears and fountain rolls assure perfect register and minimum friction and noise in high speed printing operations.



Meehanite crankshafts combine high fatigue and wear resisting properties with excellent damping qualities that reduce resonant vibrations and provide smoother engine performance.

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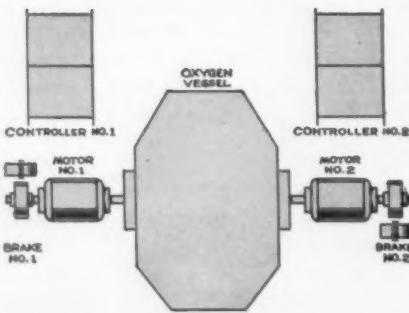


Installation Photos, courtesy of McLouth Steel Corporation.

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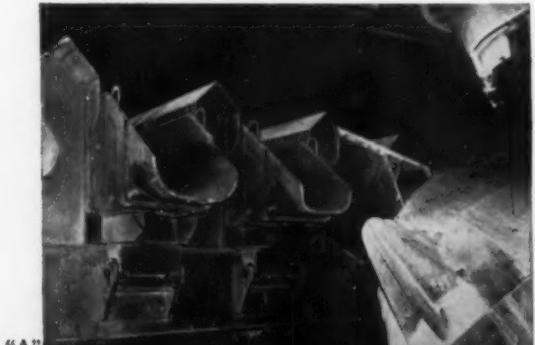
The first Oxygen Converter installation in the United States was built by Pennsylvania Engineering Corp. and is EC&M controlled.



STEEL IN MINUTES FROM SCRAP AND HOT METAL

Photo "A" shows the scrap car charging scrap into the tilted oxygen vessel. The hoppers on these cars are also used for carrying other additives to the converter. When charging Hot Metal, as in Photo "B", the ladle and the vessel are tilted in unison toward each other for accurate metal transfer.

All operations (tilt and propel) of these cars are EC&M Controlled. Propel motions are also equipped with EC&M Type WB Brakes.



"A"



"B"

ELECTRIC MOTOR CONTROL FOR OXYGEN CONVERTERS

For simplicity and maximum safety . . . the scrap car, hot metal car and oxygen vessel tilt, shown here, are equipped with constant potential drives using series wound motors and series brakes.

EC&M Magnetic Controllers provide maximum dependability for all drives and maintain high production under the safest conditions.

We invite you to discuss control for this newest hot metal application at your convenience. Call an EC&M engineer to learn the advantages of this safe, low-cost control for hot metal handling.



HOT METAL poured from converter vessel into ladle-car below. EC&M Control provides slow speed to avoid spills . . . to permit safe pouring speeds.

CONTROL APPARATUS WITH A REPUTATION FOR SAFE HANDLING OF HOT MOLTEN METAL

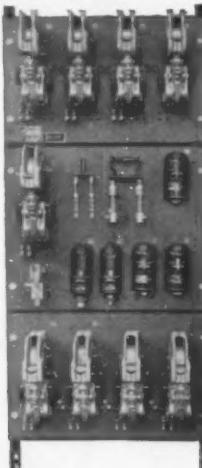
- 2 BRAKES
- 2 MOTORS
- 2 CONTROLLERS
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EC&M Bulletin 1190
Cam Master Switches,
mechanically connected
by quickly detachable
coupling.



EC & M Bulletin
1110-2 Rotating
Cam Limit Switch
for car-idle tilt.



Typical EC&M TIME-CURRENT Controller for Hot Molten Metal Service. Of the Reversing-Plugging Type, with Armature shunt slow-down on first point.



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Type E Limit Switch
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EC & M Type WB
Brake with 2 separate
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TAB-WELD
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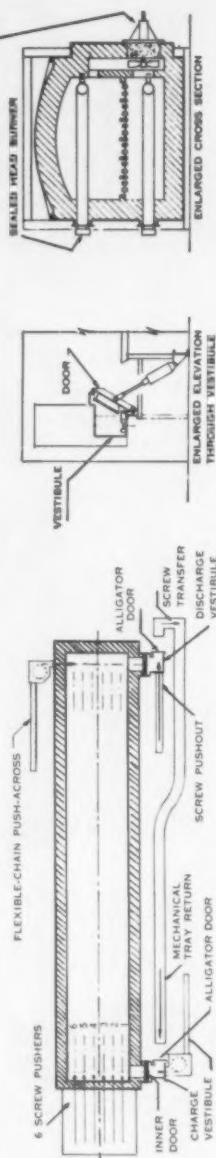
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PERSONNEL

F. E. Loeffler, named manager, sales promotion, Electro Metallurgical Co., Div. of Union Carbide and Carbon Corp., New York.

J. Douglas Patrick, named product development engineer, MacDermid, Inc., Waterbury, Conn.

J. L. Carroll and **A. M. Davidson**, named sales representative, Allis-Chalmers, Washington, D. C., and Charleston, W. Va., districts, respectively.

Dan H. Onstine, Jr., and **Gerald B. Schultz**, appointed sales representatives, Los Angeles and Dallas districts, respectively, Allis-Chalmers Industries Group.

R. H. Cullen, named abrasive engineer, Sterling Grinding Wheel Co., Tiffin, O.

John H. Granger and **William R. Miller**, named sales representatives, Leschen Wire Rope Div., H. K. Porter Co., Inc., St. Louis, Mo.

James Boyd, named abrasive engineer, Pittsburgh area, The Penninsular Grinding Wheel Sales Corp., Detroit.

W. W. Stewart, named chief financial officer, The Hydraulic Press Mfg. Co., Div. of Koehring Co., Mount Gilead, O.

A. B. Vestal, named planning engineer, Plant Development Div., Jones & Laughlin Steel Corp., Pittsburgh.

OBITUARIES

James Knivetton, vice president, engineering, Selas Corp. of America, Dresher, Pa.

Newman M. Marsilius, Sr., 66, chairman of the board, Product Machine Co., Bridgeport, Conn.

Joseph D. Walsh, works manager, Scullin Steel Co., St. Louis, Mo.

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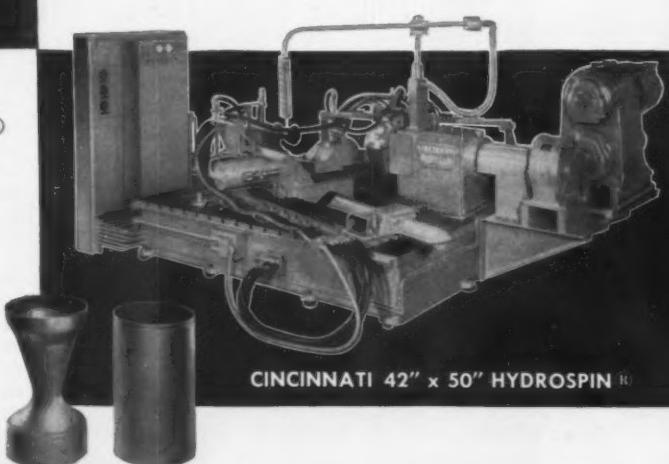
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How one automotive manufacturer

The Press that takes Model Changeover in Stride

Here's a press that's fully automated—parts are automatically fed, moved through the sequence of dies and unloaded without manual effort.

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Transflex Presses put an entirely new light on the economies of mass production. When the entire cost of the proposed automated equipment had to be written off against one product, this severely limited the possible applications of transfer presses. It required an extremely large volume of production and confidence in the stability of product design to justify such a one purpose expenditure.

Transflex takes the risk out of these calculations.

Clearing engineers have designed Transflex so that it takes model changeover in stride. Transflex

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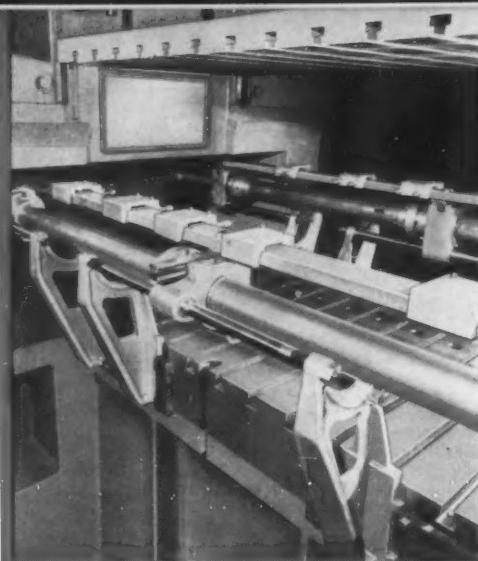
A battery of Clearing Transflex presses including the one above has solved the "automation without risk" problem for a large automotive manufacturer. However, boosting production for your company may take an entirely different approach. Clearing engineers deal with matters like these daily. Why not call on them for a discussion of improved production through Transflex? There'll be no obligation, of course.

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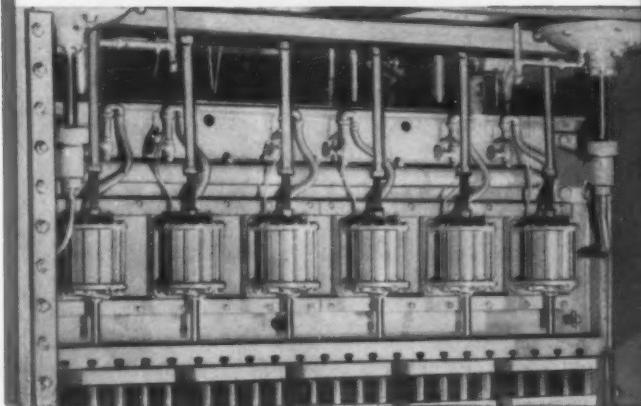
ADJUSTABLE FEED

Both the length of feed stroke and the spacing of the transfer fingers are easily adjustable on a Clearing Transflex Press. Fingers are quickly interchangeable to grip a variety of contours and hold a number of sizes.



ADJUSTABLE KNOCKOUTS

The Transflex knockout arrangement utilizes a series of air cylinders to eject pieceparts at each die station. Cylinders are mounted on ways and are easily moved right and left to conform to changed die arrangements. Positive mechanical knockouts provided as a safety factor are also mounted in tracks, making them fully adjustable.



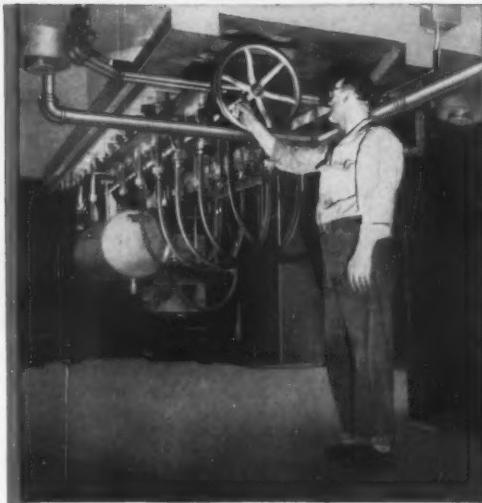
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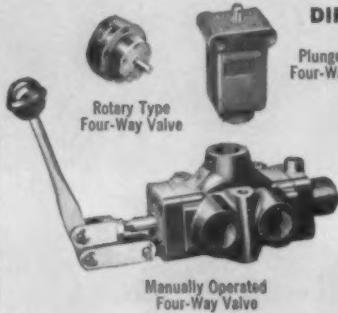


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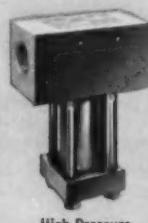


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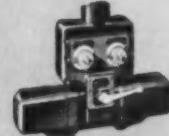
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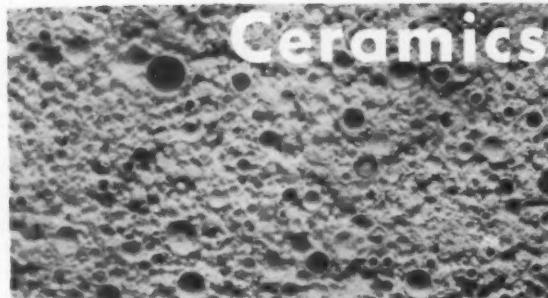
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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Get Better Wear Resistance With Ceramics

- ◆ Ceramic-type materials are beginning to take the lead in the battle against wear . . . For many industrial applications, they are cheaper than special alloys and superior in terms of life span.
- ◆ Some of the better-known ceramics have been around for a long time . . . Others are relatively new . . . This article brings you up-to-date on many of the ceramics now available, points up their individual importance in terms of specific applications.



By F. C. ROE, Senior Engineer, Technical Service, The Carborundum Co., Perth Amboy, N. J.

◆ ANY MATERIAL that will wear better and last longer is likely to command the immediate interest of the metalworking industry.

To ask "why?" is to ask "how important is wear?"

Aside from the negative aspects (breakdowns, costly replacements), the key to the answer is linked with the extensive developments designed to improve metallic, ceramic, plastic, fabric, and other man-made materials. Many of these developments have been pushed at great cost and even greater speeds. All have been aimed at producing important savings to the consumer.

Ferrous alloys now play a major role in wear resistance because of their inherent strength and hardness. Ceramics have been slower

in their development. But, significantly, more than one non-metallic is now complementing, supplementing—or even replacing—expensive metallic materials.

Improvements in ceramics have fanned out to match a variety of industrial needs. Starting with natural advantages (ceramics won't oxidize as do metals, won't rot as do wood and leather), ceramic development has concentrated on changes in raw materials and techniques of firing.

Main objectives have been to improve hardness, density, chemical resistance, surface imperviousness, and other desired properties. To effectively compete with metallics, cost factors and ease of application have also entered the picture.

A range of ceramic-type materials that have varying ability to resist different kinds of wear are now available. Because they tend to overlap in some respects, they cannot be narrowly classified. To date, an "all purpose" wear-resistant ceramic is simply non-existent.

Fired clay leads list

But there are a number of widely used ceramics that can be had at an attractive price. One of the most common is hard fired clay. Under this classification can be listed three natural clay-base materials: 1) paving brick, 2) acid-proof brick, and 3) stoneware.

Hard fired porcelains are also common. Composed principally of

Direct Abrasion Test Ceramic Wear-Resistant Materials

	Material Removed, cu. in. Using Aluminum Oxide	Material Removed, cu. in. Using Silicon Carbide
Paving hard fired clay	.0043	.0062
Acid-proof hard fired clay	.0028	.0039
Basalt	.0028	.00495
Hard fired porcelain	.0022	.0048
Special porcelain	.001	.0011
Silicon carbide	.0029	.0039
Si ₃ N ₄ bonded silicon carbide	.0016	.0019
Densified silicon carbide	.0002	.00085
Fused cast	.0006	.0011
Sintered alumina	.00025	.0009
Boron carbide	.00035	.00075

FIG. 2—This chart shows the relative resistance of some ceramics to direct abrasion as measured in U. S. Bur. of Standards tests.

finely-ground silica, clay, and feldspar, they can be formed to a variety of desired shapes. After drying, porcelains are vitrified in kilns at temperatures up to 2700°F.

Several special porcelains have been developed as improvements over the regular mullite types. In this group, the normal silica constituent is replaced with cordierite, zircon, or alumina. While composition varies greatly, as do special properties, the special por-

celains have greater strength, refractoriness, and resistance to wear.

Remelted basalt is a carefully selected natural volcanic rock material that is remelted in a furnace at elevated temperatures. The molten material is cast into molds to form desired shapes.

Silicon carbide is produced by a chemical reaction between sand and petroleum coke in electric furnaces at about 4000°F to form a "pig" of crystalline material. The

Hardness Of Dense Ceramic And Cermet Materials

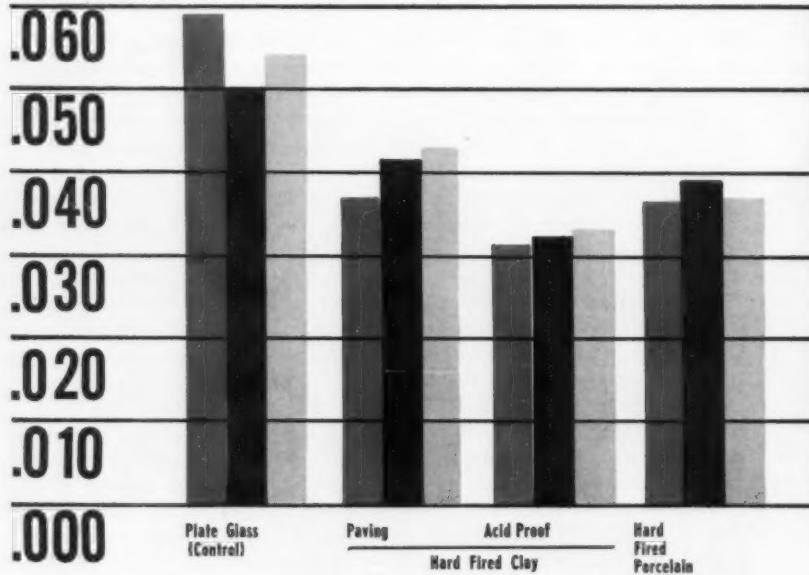
	Knoop Hardness (K-100)
Tool steel—Rc 60.5	750
Hard fired porcelain	550
Special porcelain	1060
Fused cast estimated from K-1000	900
Sintered alumina	1700
Si ₃ N ₄ bonded silicon carbide	2500
Densified silicon carbide	2500
Boron carbide	2800

FIG. 3—Both Knoop hardness values and relative wear resistance are correlated from the values contained in both Figs. 1 and 2.

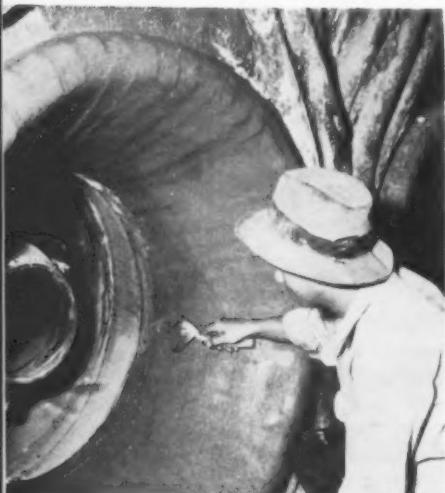
individual crystals are exceeded in hardness only by boron carbide and diamond. After crushing "pig" lumps and screening, carefully sized granules are selected and mixed with ceramic bonds. The mix is then formed and fired.

FIG. 1—(Below) Relative abrasion resistance of some of the more commonly used ceramic materials is rated according to Zeiss testing results.

Penetration In.



Range of ceramic-type materials to resist different kinds of wear are now available.



Silicon nitride bonded silicon carbide is different in that high temperature firing of formed shapes is accomplished in a nitrogen atmosphere. The silicon nitride bond thus formed provides a tighter, stronger bond than the normal silicon dioxide bonds. It results in a superior product, especially from the standpoint of abrasion resistance.

The raw material for sintered aluminum oxide is a finely ground calcined bauxite or tabular alumina. It is usually formed under very high pressure to the desired shape and then sintered by firing in kilns at temperatures up to 3200°F.

There are also several fused cast materials—cast monolithic refractory or ceramic materials—each using a different mix of raw materials and thus differing in final properties. The principal material is alumina in the form of purified bauxite ore. To this may be added zircon, chrome, or other ores. The mix is melted in an electric arc furnace at about 3700°F.

Comparative resistance to abrasion of some of these materials when subjected to an air blast of hard granules in the standard Zeiss hardness testing equipment is shown in Fig. 1. Comparative

resistance to direct abrasion of similar materials with U. S. Bureau of Standards equipment is illustrated in Fig. 2.

Many of the important physical properties of established ceramic materials are listed in Table 1. Some of these properties have no bearing on ability to resist wear but are essential in developing designs for application.

Knoop hardness is included in Table 1 only for sintered, fused, cast or similar monolithic-type ceramic and cermet materials. A reliable Knoop hardness value is not obtainable for the less uniform ceramic-bonded materials since point penetration frequently would be in the bond between granules of the base material.

Role of hardness

Fig. 3 shows the noticeable correlation between Knoop hardness and the wear resistance of corresponding materials as charted in Figs. 1 and 2. This suggests that for the monolithic-type materials, including many new materials to come, Knoop hardness results can be used as some measure of ability to resist wear.

The density characteristic of one material as compared with another, while important, is not a measure of ability to resist wear.

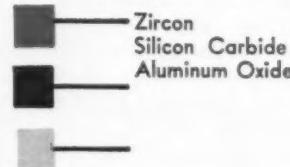
It is well established, however, that the higher the density among various grades of a single given kind of ceramic bonded material—such as silicon carbide—the greater the ability to resist wear. For this reason, it is desirable in using any particular ceramic bonded type material, to select a composition with density equivalent to, or greater than the value listed in Table 1.

It is rather obvious that no two applications involving wear are alike. The factors that cause wear



One outstanding advantage of ceramic materials is the ease with which they can be cast to shapes.

Wearing Effect of Air Blasted Abrasive Granules—Zeiss Test on:



All with 100
(screen mesh)
size grain

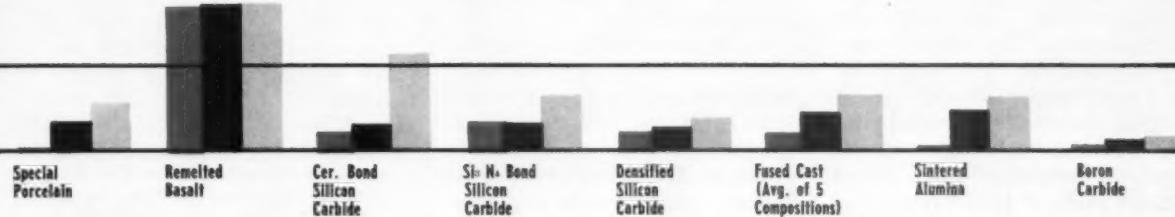


Table 1 Physical Properties Of Ceramic-Type Materials Used For Wear Resistance

	Hard Fired Clay	Hard Fired Porcelain	Special Porcelains	Remelted Basalt	Ceramic Bonded Silicon Carbide	Si ₃ N ₄ Bonded Silicon Carbide	Sintered Aluminum Oxide	Fused Cast Materials	Boron Carbide
Density GM/CC	2.30	2.40	3.30	2.88	2.57	2.80	3.61-3.95	3.50	2.51
Modulus Rupture, Psi	3500			3900	2000	5500	25,000	>1500	45,000
Compressive Strength, Psi	10,000	160,000	200,000	>6500	15,000	20,000	300,000		400,000
Coeff. of Linear Expansion (25-1000° C.)				7.89 × 10 ⁻⁶	4.4 × 10 ⁻⁶	4.7 × 10 ⁻⁶	9.14 × 10 ⁻⁶	8.2 × 10 ⁻⁶	4.5 × 10 ⁻⁶
Thermal Conductivity (British)	11.3			170	109	113.5	230	43	250
Porosity, pct	4.0-7.0				13.2	6.0-10.0		2.0	
Mean Specific Heat Btu/lb.	0.258		0.18		.285	0.289	.188		
Resistance to Acids (Except HF)	Not Attacked	Not Attacked	Not Attacked	Not Attacked	Not Attacked	Not Attacked	Not Attacked	Not Attacked	Not Attacked
Resistance to Alkalies	Attacked	Attacked	Attacked	Attacked	Attacked	Attacked	Not Attacked	Slight Attack	Not Attacked
Firing Temperature °C.							1700-2000	1700	2400

are so numerous that the number of combinations is literally astronomical. This is one reason why there is no "universal" material that will provide the most economical life of resistance to wear in all applications.

Because there are so many variables involved in each field of application, experimental or pilot testing usually precedes every potential use. Frequently it is possible to install a "panel" or partial lining to establish life and prove economy.

Empirical development has evolved an extensive number of excellent uses for ceramic-type materials in each of the general areas of use. Cyclone dust collector linings, for example, are subject to excessive wear under certain severe conditions such as are found in the separation of ore sinter dust or fly ash.

Rubber won't do

Large units are required which makes lining maintenance an important cost factor. Temperatures are above 500°F as a rule, so that rubber or a similar wear-resistant material cannot be considered.

Unprotected cones and inlet areas of standard fabricated steel cyclone collectors will wear rapidly. Partial protection with cement coating or castable refractory lining provides little improvement. Prefired refractory brick shape linings made of hard burned clay were tried at an early date. This

deferred initial repairs for about six months.

Large collectors of this type are now lined with ceramic-bonded silicon carbide brick shapes. This represents a considerable advance and has increased life to six or more years.

These are new

Other important applications in which significant improvements have been made include gas scrubber linings, transfer pipe lines, bends, stack linings, process equipment parts, spray nozzles, mixer blades, and centrifugal slurry pumps.

With few exceptions, recently developed ceramic-type wear resistant materials show increasing superiority over the older, more established materials. Major drawback is that the newer materials generally cost much more on a unit weight basis.

Total cost or economical use of established materials versus new materials is directly related to performance. Any cost analysis should also include a factor evaluating out-of-service time for replacement of abrasion resistant equipment parts.

While higher initial cost and increasingly longer time to prove value will tend to slow the establishment of the newer materials, progress still favors their ultimate use. Best known of the newer ceramics and cermets are boron carbide, densified silicon carbide,

nickel aluminide, zirconium boride, chromium boride, and molybdenum boride.

Certain general conclusions can be drawn regarding the role of ceramic-type materials for applications requiring resistance to abrasion:

1) Performance of ceramic linings measured in life span is superior to alloys and other materials for the most of the applications mentioned.

2) Similarly, total cost of ceramic linings, measured in units of product handled, is lower than for special wear-resistant alloys or other abrasion resistant materials.

3) Ceramic-type linings are especially advantageous over alloys and other materials when the abrasion factor is increased as a result of corrosive conditions and/or high temperature.

4) Use of ceramic-type linings results in minimum contamination of product being handled.

Conversely, ceramics are of limited value in applications involving high tensile stress, heavy and sharp physical impact, appreciable differential thermal expansion, extreme thermal shock, and extreme dimensional limitations that render molding or firing impracticable.

Reprints of this article are available as long as the supply lasts. You may obtain a copy from Reader Service Dept., THE IRON AGE, Chestnut & 56th Sts., Philadelphia 39, Pa.

How Measurements Lead To Effective Quenching

By VICTOR PASCHKIS, Technical Director, and GEORGE STOLZ, JR., Research Engineer,
Heat Mass Flow Analyzer Laboratory, Columbia University, New York

♦ Accurate temperature measurements are taking the guess work out of quenching, making the heat treaters' job easier and much more scientific . . . The secret lies in continuously recording temperature change of parts in the quench bath.

♦ How effective is an agitated quench? . . . Still water? . . . Quenching in brine? . . . These and other pertinent questions are covered in an authoritative review aimed at providing practical answers for heat treaters and metallurgists.

♦ BOTH the type of steel and method of heat treatment must be properly matched to produce a part with a given hardness and other desired mechanical properties. Considering only one aspect of the problem is not likely to result in a successful solution.

Despite this inherent relationship, the Jominy test is still used to determine the "hardenability" of a steel by quenching in a water spray. It is assumed that the hardenability values obtained can also be applied to cooling procedures with completely different rates of temperature drop—such as cooling in warm oil.

In heat treating, a large number of factors can affect the rate of temperature change. This rate, incidentally, is not constant during the quenching operation. It changes greatly with time. All of these factors are interdependent. At any given time, the rates at any point in the part treated depend on all of them.

For purposes of analysis, it is possible to group these variables

into two major classes: the internal and the external factors. Internal factors include size, shape, and the material of which the part is made. The material, in turn, can be described in terms of its thermal properties such as thermal conductivity, specific heat, density, heat and range of transformation.

External factors can be summed

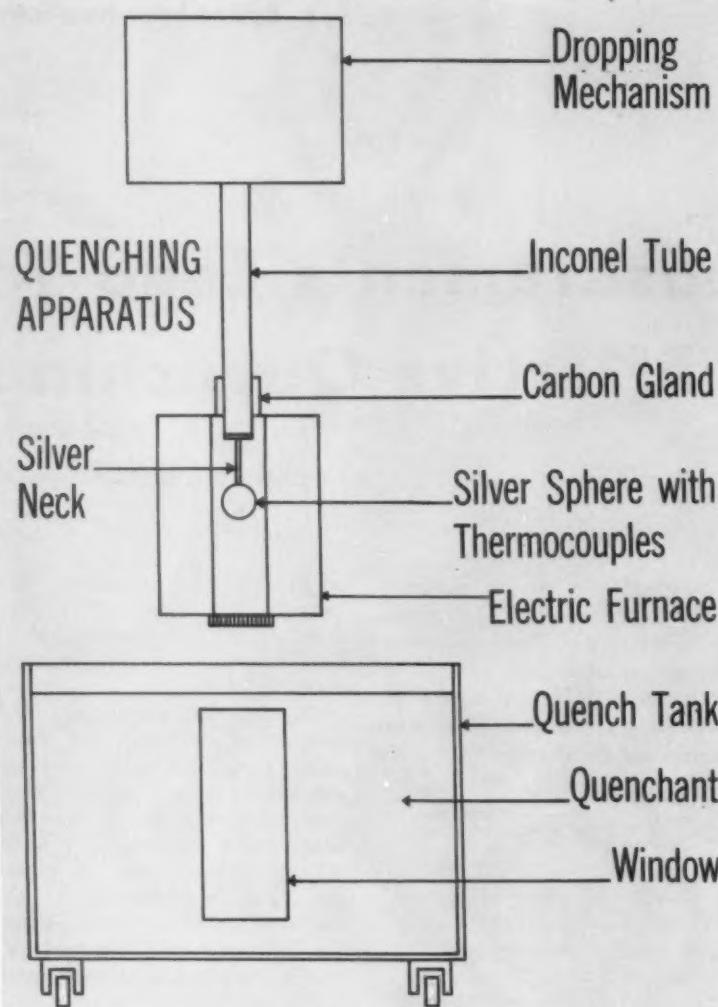
up in terms of "boundary conductance." This is the rate of heat flow from the surface of a quenched article to the quenching medium.

The internal factors are well understood, although for many steels numerical values are not yet known with desirable accuracy. The subject of boundary conductance, on the other hand, is largely unexplored. A recent test program conducted by the Research Laboratories of Columbia University was designed primarily to investigate the lesser known external factors.

The concept underlying the determination of boundary conductance is that such conductance is independent of the material below the surface. As far as the solid is

Table 1

Tube Diameter, in.	Average Water Velocity at Tube, Entrance, fpm	Cooling Time, sec. 1600° F to 250° F
5.5	—	39.9
5.5	0.0732	25.9
5.5	0.844	10.5
4.0	1.107	7.8
Concentration (NaOH)		
0% wt.		39.9
1% wt.		14.8
5% wt.		5.0



concerned, it is dependent on surface roughness only.

It is possible to determine boundary conductance by using a silver sample. In Fig. 1 is shown an experimental setup consisting of a spherical sample made of silver which is connected by a tube to a dropping mechanism. The sample is suspended in a vertical furnace, closed at the bottom during heating. When the sample achieves uniform temperature, the lid is opened and the sample drops at controlled speed into the quench bath.

Obtain curve

Temperatures are measured within the sample, since thermocouple wires attached to the surface of the sample would interfere with heat flow and fluid flow pat-

FIG. 1—(Above) Simple test apparatus makes it possible to determine cooling rates, boundary conductance.

terns in the quench bath. A temperature-time curve within the sample is thus obtained.

Work completed to date includes quenches in still water under a variety of conditions, in agitated water, and in caustic soda. From the temperature-time curve obtained, the quantities, surface temperature, heat flux, and boundary conductance—each as a continuous function of time—are computed. An analog computer known as the Heat and Mass Flow Analyzer is used for this purpose.

When quenching in still water,

the temperature of the water is very important. Three cooling curves for a 2-in. diam. silver sphere quenched in water at different temperatures are shown in Fig. 2. Note that the time required to drop from 1600° to 250°F changes greatly as does the nature of the curves.

At intermediate water temperatures, the vapor film breaks down and re-forms repeatedly. The resulting temperature curve is characterized by a number of humps. At low or high water temperatures, the break of the film is sudden and happens only once.

Check variables

Extremes of cooling times recorded were 6 seconds for quenching in 40°F water and 66 seconds for quenching in 160°F water.

Another significant variable is the depth of immersion. Here defined as the distance from the water level to the top of the test sphere, cooling rate tends to vary considerably. At a depth of $\frac{1}{8}$ in., the cooling time is 37.6 in 110°F water. The temperature drop involved is from 1600° to 250°F.

Changing only the depth of immersion, cooling time required at $2\frac{1}{2}$ in. is 23.6 seconds. At a depth of $5\frac{1}{4}$ in. cooling time drops to 19.4 seconds.

Velocity of immersion has only a minor effect. Decreasing immersion speed from 42 in./second to 14 in./second results in an increase of cooling time from 23.6 to 26.6 seconds.

The overall size of the quench tank is of great importance. In a large tank, 31 in. x 38 in. and 24 in. deep, cooling required 23.6 seconds. In a smaller cylindrical tank 5.5 in. diam. and 24 in. deep, 39.6 seconds was required. In both cases, the depth of immersion was $2\frac{1}{2}$ in. and the velocity of immersion was 35 in./second.

The increase in cooling time in the smaller tank cannot be explained in terms of an increase in average water temperature. This increase is actually only 8°F, certainly not enough to account for a 65 pct increase in cooling time. The increase may possibly be explained in terms of a proximity effect of the tank walls.

The most commonly used method of increasing cooling velocity is agitation of the coolant. To check the effectiveness of agitation, water was pumped through vertical plexiglas tubes. Results, showing the influence of velocity, are tabulated in Table 1.

Another way of increasing cooling speed is the addition of sodium hydroxide to the water. The shorter cooling times resulting from an increase in the concentration of the hydroxide are also shown in Table 1. It is likely that the combination of high quenchant

velocity and sodium hydroxide would further reduce cooling times.

From the cooling curves obtained in these experiments, values of boundary conductance can be computed. It is also possible to derive plots such as those shown in Fig. 3.

From boundary conductance-vs-surface temperature curves, temperatures at several points in the silver sample, or in a steel sphere of the same size, can be computed. When enough curves of the type shown in Fig. 3 are obtained, it

will be possible to predict the cooling rates of bodies of any shape or size. Also, temperature distribution in a single piece can be determined.

Accumulation of this kind of information is bound to prove of immediate practical value to the heat treater and metallurgical in solving quenching problems.

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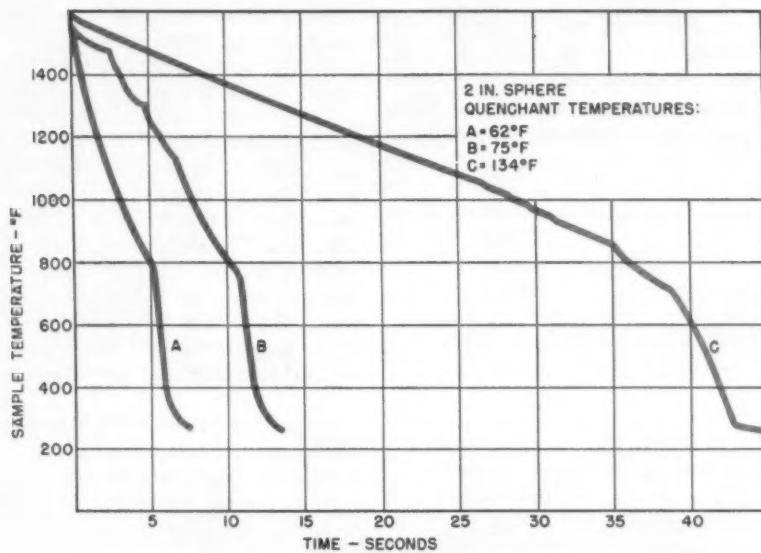


Fig. 2

Quenching in water can vary in effectiveness depending upon the temperature of water.

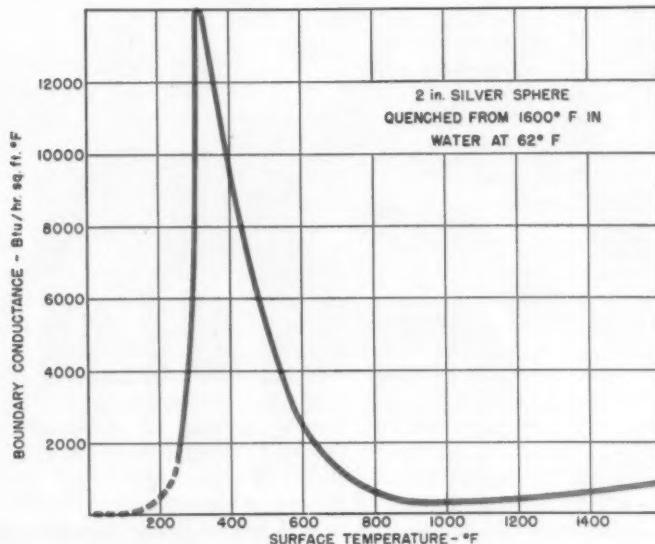


Fig. 3

Values of boundary conductance can be readily computed from cooling curves.

Computers: Shortcuts To Better Machinability

♦ Machinability computers, relatively new on the metalworking horizon, are solving a variety of plant problems . . . Feed them the proper "knowns" and they serve up, from reams of stored data, the information sought.

♦ Troubleshooting, training, setting time standards, making realistic cost estimates, deciding basic machine tool purchasing requirements—these are some uses . . . Both job and high-production operations can profit.

By H. J. SIEKMANN, Engineer-in-Charge,
Machinability Laboratory, Metallurgical Products Dept.,
General Electric Co., Detroit

♦ ONE MACHINE SHOP was taking 60 minutes to machine an 80-ft, 29-in. diam shaft. It now completes it in 27 minutes. Another plant was getting a discouraging 4½-minute life from carbide tools in turning axle shafts at 770 fpm. Now, with speed reduced to 425 fpm, it gets a 45-minute life.

Both problems were solved without resorting to customary time-consuming methods. Each plant took advantage of the analytical shortcuts made possible by using a machinability computer.

Finds many uses

Developed by General Electric's Metallurgical Products Dept., the machinability computer is finding use in many plant planning and methods departments to establish proper machining speeds and feeds for the horsepower available. It's helpful for trouble-shooting machining operations on plant floors, for setting realistic time standards before a machining job is run, and for other applications (see chart).

Basically, the computer condenses and stores reams of machinability data from numerous hand and textbooks. It makes this available in easily useable form to engineers coping with everyday machining problems.

In the hands of properly-qualified and experienced personnel, the instrument is a life-saver on job shop operations. The object is of course to get the work out the door with a minimum of time lost burning up tools in determining what the correct machining conditions are.

Here the computer can do a quick job of giving the operator correct spindle speed and horsepower to take the cut. If he is machining an unfamiliar material, or under conditions not previously experienced, a few turns of the computer knobs can provide the answers.

In high-production shops where a half-cent can make a great deal of difference, the instrument is an invaluable aid in arriving at final optimum conditions. Many times,

months can be spent modifying jobs to bring them down to ideal conditions in terms of cost.

Under such circumstances, by first placing the operation under a temporary condition (e.g., estimating cutting speed for the set-up), data can be obtained that will enable the computer to pinpoint the operation within minutes of tool life. Then—by re-entering the data obtained on the computer—the production job can be adjusted to exact conditions desired. Thus a week may bring the same end-results as months of previous effort.

When it is felt that existing conditions can be modified to increase production, the computer can provide a factual basis for making such changes, eliminating personal opinion.

The computer is useful for providing answers about numerous machining variables, including tool design, hardness, type of material, speed, feed or horsepower.

Not utilizing capacity

The plant turning the 80-ft shaft, for example, was running the job on a 40-in. Niles lathe equipped with a 40 hp motor drive. The shaft was an AISI 4340 steel with 190 Bhn hardness. It was being machined with carbide at 230 fpm, with 1/32 feed and 0.200-in. depth of cut. At 25 rpm, only 17 hp of the available machine capacity was being utilized.

A change of carbide grade was suggested to increase production. But by putting the computer to use, and factoring in the new carbide tool along with other fixed factors, a solution for the feed needed to absorb the advantage of

the improved carbide was calculated.

As a result, the job is now running at 0.072-in. feed. And 38 of the 40 available horsepower are being used, increasing production 100 pct.

In the other instance involving tool life, a small machine tool builder supplied an automatic tracer lathe to one of the larger automotive plants in Detroit. But the maker was having difficulties meeting the specified production quota for the machine. Workpiece whipping was felt to be the problem, and it was suggested that a device be rigged to support the work.

Under the same machining conditions, the machinability computer gave a tool life of five minutes. This suggested a reduction in cutter speed was the best way to get reasonable tool life. An assumed tool life of 45 minutes was fed to the computer, and the instrument came up with a cutting speed of 425 fpm.

This solved the problem without resorting to fixtures.

In another instance, trouble-

Apply Computer To Quickly Determine:

Proper speeds, feeds for available horsepower

Realistic time standards

Machining cost estimates

Basic machine tool purchasing needs

Cost comparisons for contemplated part or tool changes

Effects on tool life (as a graphic demonstration in training courses) with changes in machining variables

Reasons for individual shop problems

shooting with the computer increased production of a water wheel stator frame by 230 pct.

Cutting tools, speed and feed were changed in this case. Previously, high-speed steel at 45 fpm with a 0.090-in. feed did the work. Now carbide is used at 260 fpm, 0.050 feed, using the same $\frac{1}{4}$ -in. depth of cut.

In making machining cost estimates, it's fairly easy to apply one or two basic formulas to arrive at a tool life desired to obtain cost per piece or maximum production

rate. But translating this to actual cutting conditions is more complicated.

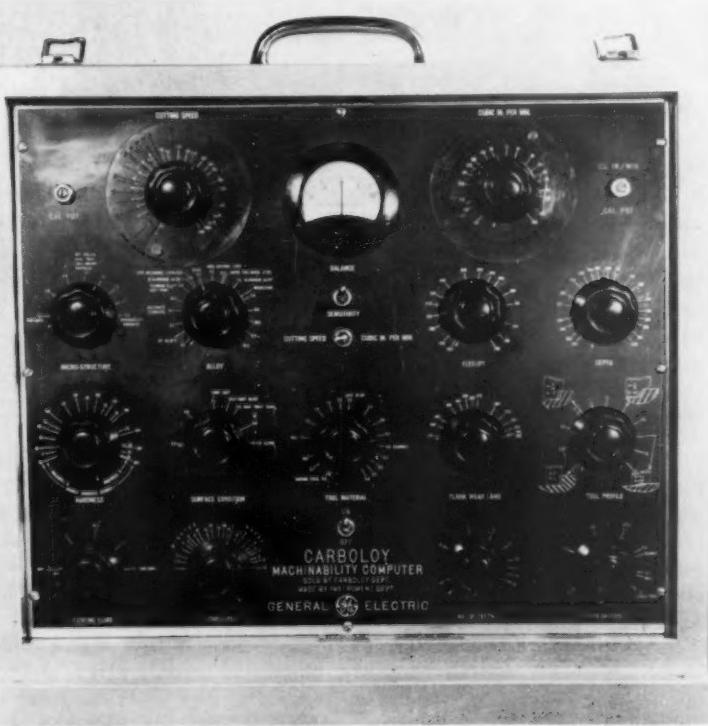
The computer not only considers tool life sought, but factors of tool design, materials being machined and other cutting conditions to calculate cutting speed and horsepower required. If too much horsepower is called for, the cutting conditions can be quickly altered to correspond with the horsepower available, while still maintaining the desired tool life.

When purchasing machines, it's necessary to know the expected production rates per machine to determine the number of new machine tools needed for a given output. The computer is a quick means of obtaining this information, since it can calculate not only production rates but also other, often-overlooked, machining factors. It's thus easier to determine number of machines required as well as size and motor capacity.

Cost comparison information, whether in connection with tool design, tool material, or part changes, can just as easily be determined with the computer.

The computer is also valuable as an aid in training tool engineers and plant supervision, and for advancing of machine operators. There is very little textbook material available for training purposes which can graphically show effects of changes in tool geometry, tool material, work material, cutting conditions, etc.

Simply by changing dials, relatively inexperienced instructors can quickly show machine operators or trainees how these variables affect tool life.



PORTRABLE, 32-lb computer permits fast, accurate determination of any of 19 machining variables. First step is setting up all known conditions.

Using standard machines—



BRILLIANT white spark stream is characteristic of grinding operations on zirconium.

What Techniques Grind Zirconium Best?

By J. J. SABER, Product Engineer, The Carborundum Co., Niagara Falls, N. Y.

◆ WHAT ARE the best ways to grind zirconium? The question will crop up in more and more metalworking plants as new uses are found for this corrosion-resistant metal and its alloys.

To find some of the answers, The Carborundum Co. conducted extensive grinding tests on both the reactor type of zirconium and a zirconium-tin alloy, Zircalloy II. Major classes of grinding investigated were: surface, cylindrical, centerless, internal, snagging and cut-off.

Results indicate that both materials can be ground successfully and in a similar manner. Wheel efficiencies are the same at conventional speeds and feeds although surface finish may vary slightly, depending on the class of grinding.

◆ Zirconium doesn't grind as easily as low carbon steel . . . But it can be ground — successfully — at conventional speeds . . . In general, silicon carbide wheels work best, although combination silicon carbide-aluminum oxide has its place.

◆ Here's practical help derived from a Carborundum Co. test program . . . Major classes of grinding evaluated include: surface, cylindrical, centerless, internal, snagging and cut-off . . . Use of coolants is also covered.

Initial tests on surface grinding established that a silicon carbide wheel has better form holding properties and produces a better surface finish on zirconium than an aluminum oxide wheel, as shown in Table I.

Next was an investigation of wheel speeds. It was confined to those thought most practical for industry—fast enough to diamond dress wheels efficiently, yet within the range that can be obtained by

changing sheaves rather than by installing new equipment. Thus, test speeds of 3000 and 6000 sfpm were easily obtained on the standard surface grinder used.

As Table II shows, the lower wheel speed is most efficient for light infeeds. At higher speeds, heavier infeed gives a better grinding ratio plus a finish comparable to that obtained at the lower speed.

Next step in the test program

Table 1

Wheel Grading	Grinding Ratio	Relative Microinch Finish	
Aluminum Oxide grain Vitrified bond 46 grit—medium grade	1.2		70
Silicon Carbide grain Vitrified bond 46 grit—medium grade	4.7		45

Wheel Grading	Infeed per Pass (inches)	Grinding Ratio		Microinch Finish	
		3000 sfpm	6000 sfpm	3000 sfpm	6000 sfpm
Silicon Carbide grain, vitrified wheel	0.001	8.6	4.7	28	45
Silicon Carbide grain, vitrified wheel	0.005	3.2	5.7	23	22

was to determine the best type of coolant for grinding zirconium; also to compare wet and dry grinding. Results showed that dry grinding is not as efficient as the wet form; moreover, use of a suitable type of straight grinding oil produced better finishes and yielded better wheel efficiencies than any other type of coolant tested. In some cases the gain in efficiency was as much as 300 pct.

Nitrite-type good too

However, Table III shows that a 10 pct water solution of a nitrite type of grinding fluid also produced good results. This coolant apparently hinders the chemical reaction between the metal and the abrasive grains, thus allowing a better grinding action.

It is important to realize that a fire hazard may exist when zirconium is ground at high speeds (6000 sfpm) with a straight grinding oil type of coolant. Special precautions should be taken (to maintain continuous coolant flow, for example) because fine, dry particles of the metal will ignite spontaneously. However, the danger of fire is less at lower speeds.

Where cylindrical grinding is required, choice of abrasive grain types depends on whether a roughing or finishing operation is involved. For roughing, tests on medium (46 grit) to fine (80 grit) aluminum oxide grain in a medium grade vitrified bond gave best results. Grit size depends on workpiece diameter.

For light finishing cuts, a silicon carbide grain wheel (46 to 60 grit) in a medium grade vitrified bond was most efficient.

These cylindrical grinding tests were conducted at conventional 6000-sfpm speed. Since this speed produced no problems, lower levels were not investigated. Test results, shown in Table IV, compare metal-to-wheel removal ratios for zirconium and other metals, based on the use of popular wheel gradings for each type of metal.

Another series of tests involved both centerless and internal grinding. In both forms of grinding, best results were obtained with silicon-carbide grain, vitrified-bonded wheels, applied at conventional feeds and speeds.

In testing portable and swing frame snagging, which is usually done dry, a combination of silicon carbide and aluminum oxide grains in a soft grade, resinoid bond wheel produced the best results: maximum cutting rate with minimum burning of metal. Wheels with all aluminum oxide grain yielded higher grinding ratios, but at the cost of badly burned metal.

Cut-off test conditions

For a series of cut-off tests, machines used were of both the standard, oscillating head type and the chopper type. Cutting rates were kept constant at a generally-accepted downfeed of five seconds per square inch of metal. Results of the series of tests show that:

(1) A coolant is necessary for a cut of highest quality. Good results were obtained with a water soluble oil in a 40:1 ratio.

(2) Rubber bonded wheels used with a coolant were superior to other types tested.

(3) Silicon carbide abrasive produced the best quality of cut of those tested.

(4) Combination of silicon carbide and aluminum oxide grain gave better wheel efficiencies, with a "good" quality of cut.

(5) Speed of 5000 sfpm produced cuts of better quality than a speed of 10,000 sfpm. Lower speeds did not increase wheel efficiency.

Table 3

Wheel Grading	Infeed per Pass (inches)	Grinding Ratio			
		3000 sfpm Coolant A*	3000 sfpm Coolant B**	6000 sfpm Coolant A*	6000 sfpm Coolant B**
BC46-J4-VE	0.001	8.6	10.3	—	—
BC46-J4-VE	0.005	3.2	10.2	5.7	7.5

* Coolant A—Nitrite type, 10 pct solution in water. ** Coolant B—Straight grinding oil

Metal	Average Grinding Ratio
Titanium	0.7
Zirconium	2.8
Low Carbon Steel (SAE 1010-1040)	50.0

Handle Chips Efficiently For Greater Shop Profits

♦ Removing oil is only a preparatory step in the more highly developed chip handling systems . . . Complete cutting oil reconditioning systems often pay their way many times over . . . Recovery varies, probably averages 20 gallons per ton of chips handled but can reach 100 gallons.

♦ Here's how plants are extracting and reconditioning cutting oils . . . Modern purification methods may double tool life, reduce machine wear and necessary oil-inventory requirements . . . Large, self-discharging extractors find wider use today in many plant systems.

♦ REMOVAL OF OIL is really only a preliminary step in some of the more highly developed chip-handling systems. Besides extractors or wringers, some companies furnish complete cutting oil reconditioning systems.

Amounts of oil recovered will naturally vary with such factors as type of chips and kinds of metals and coolants used. Some plants may get as much as 100 gallons, other plants as little as 20 gallons per ton of chips handled. Probably 40 gallons is a reasonably good average.

What are some of the auxiliary items used with extractors in complete systems?

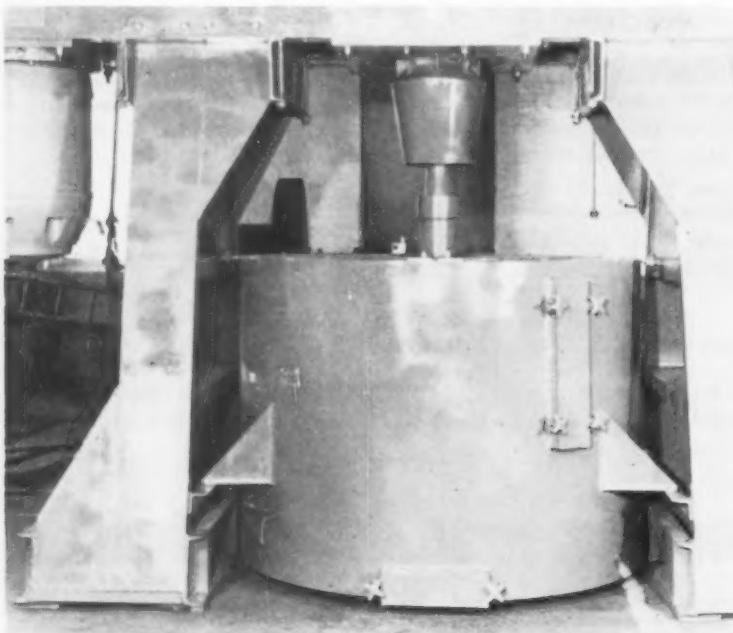
Four or five other components are commonly used. These include, besides extractors and wringers, sterilizers, sediment precipitators, settling and storage tanks and other accessory equipment, including electric hoists for handling.

Option in wringers

One firm supplying such systems furnishes chip wringers in both spindle-post and free-center types, both using sloping side chip pans. These provide easy at-turning-speed oil drainage.

Sometimes a considerable number of chip baskets are obtained and used as tote pans for original collection of chips. This saves one handling step at the extractor.

These useful baskets are really one-piece drawn steel pans without perforations, and with top edges machined flat. Flat, close-fitting covers are furnished. These



Turbine Equipment Co.

INSTALLED in a Southern ordnance plant, this large 60-in. extractor goes through its cycle completely automatically.

leave only a small aperture (caused by the pre-calculated force of the average heavy load of oily chips against the angle of the basket slope and the flat cover) for escape of recovered oil.

Two different types of chip wringers in several sizes, as supplied by one company, are V-belt driven by specially-designed electrical motors. These have extra power to allow quick starting under heavy loads, and also act as brakes.

Extractors include link-suspended and base-bearing types. Link-suspended units permit two different arrangements of baskets and covers. One, which allows basket and cover to be handled as a unit, requires that all basket loading be done outside the machine. Another arrangement permits either inside-the-machine or outside loading, since the cover is handled separately.

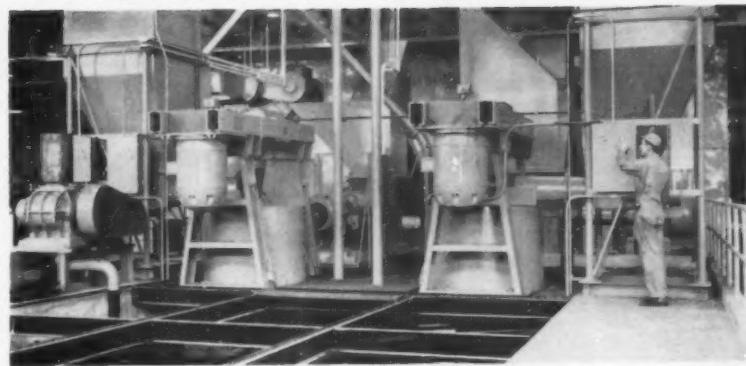
Two extractor models

Base-bearing extractors have the bearing assembly mounted in resilient cushioning material. Two models are used. One, primarily for hand-loading, handles to 10 loads per hour. The other, a heavy-duty model, operates at up to 20 loads an hour, usually with power-hoist handling of baskets for fast production.

Far greater recovery of oil is always effected when chips are first crushed. Good centrifugal machines will recover practically all the oil from crushed chips.

For reasons both of material-handling and labor time required, it is often more economical to install extractors of larger size than might be indicated. It sometimes allows a man to do in one shift what might otherwise run into bothersome and expensive overtime.

Use of a good centrifugal oil purifier has been found the most efficient way to purify oil recovered from chips and turnings. Separated oil run through this secondary centrifugal can be brought to practically the effectiveness of new oil. Wider recognition of this is leading to more and more systems being installed with such auxiliary equipment.



Turbine Equipment Co.

PART of complete chip system, twin 48-in. self-discharging chip extractors see service in transmission plant of major automaker.

Such purification may double tool life. Tests show that centrifugally-purified cutting oil—since tool-wearing, fine metal particles are removed—extends tool life markedly.

Obviously, this reduces machine outage and permits more accurate work as well. On various automatic screw machines, cutting oil spreading over the work also has something to do with lubricating various guides, spindles and bearings. Oil free of tiny metallic specks minimizes wear on these parts as well. Risks of dermatitis are also reduced.

At some extractors, oil recovered from chips pumps first to an accumulating settling tank, then to a centrifugal separator or purifier for reconditioning before being recirculated through the cutting oil system. Other times, it may flow from the settling tank to sterilizer tanks for heating before centrifuging.

Sterilize at 180°F

Sterilization of oil is effected by heating to approximately 180°F and holding at that temperature for a few hours. Heat can be from a steam coil or from an electric heater.

Heating reduces viscosity of oil. Hence heavier settling move downward more readily. Where a cone-bottomed tank is used, they will drop into the conical section and can be drawn off at intervals. Later, the sterilized oil passes through a centrifugal oil purifier where fine sediment and any water left are removed.

From the reconditioner, oil discharges into a purified oil collecting tank, then to a clean-oil storage system.

Crushing, while helpful in recovering more oil, also introduces additional particles of steel dust into recovered oil, making use of secondary purifying equipment important.

Several pumps used

Many highly developed oil-reclamation systems use three or more pumps for handling. These transfer oil from settling to sterilizing tanks; thence to centrifugal purifiers and clean oil tanks and to other points as needed.

Occasionally, large self-discharging extractors are used. One such 60-in. machine is installed at Michaud Ordnance Plant in New Orleans, and was built by American Tool & Machine Co.

Such extractors are not really new, and have been used in many large plants. But their application to handling crushed chips is relatively new. They permit operation to be completely automatic throughout the cycle. After centrifugal force has removed the oil, chips drop as a mass through the bottom of the basket into a surge hopper. They're then removed to an outside bin for railway loading.

Different control panels and automatic controls are available for use with such continuous extractors or with complete chip handling systems. These are, of course, tailored to the plant's particular requirements.

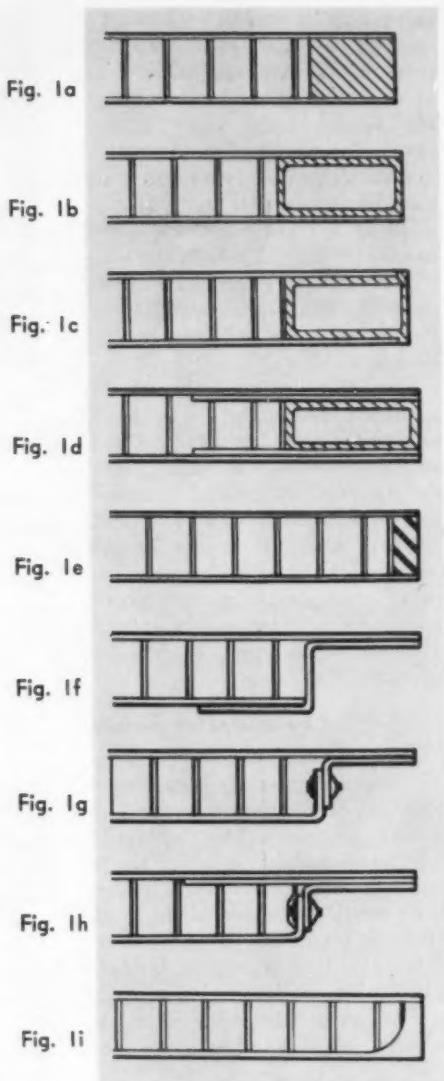
Expands usefulness—

Design Sandwich Structures For Higher Local Loading

By R. W. SPENCER and T. F. FREEMAN,
Senior Research Engineers,
North American Aviation, Inc.,
Downey, Calif.

◆ Bonded sandwiches have appealing properties, including highly efficient use of material . . . Until recently, loading problems have limited their use largely to the aircraft industry . . . Current designs can frequently solve these problems.

◆ A number of simple and generally acceptable designs now exist as standards for joints, edge members and inserts of sandwich structures . . . Such developments are encouraging use of sandwich construction where previously it wasn't feasible.



◆ SANDWICH structures, originally developed to save weight in aircraft construction, appear to be gaining a foothold in other industries too. These fields include building construction, shipbuilding, and perhaps transportation equipment as well. Better design and the improved properties resulting also seem likely to extend their usefulness.

Bonded fabrications of the sandwich type suffered a serious limitation in the past that has limited acceptance. They do not possess sufficient compressive strength to resist high local loads. So bolts, rivets, screws and other mechanical fasteners tend to crush or distort the structure. Similarly,

sandwich panels do not have the toughness to withstand high impact loads against their unprotected edges.

A number of standard edge member, insert and joint designs have been developed that help overcome these problems. Their intent is to spread out the local load over a greater panel area. Such designs as shown here can accomplish this successfully.

One primary concern in structural sandwich fabrications is the edge member. This part protects the core material from dirt and moisture, and helps reduce crushing and denting of the panel on being hit. The edge member also transmits shear loads and provides a means of joining one panel

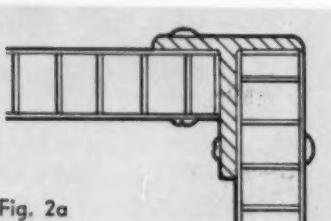


Fig. 2a

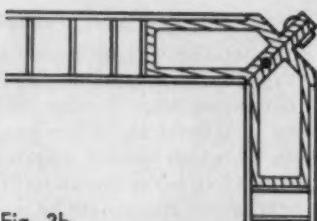


Fig. 2b

to another, or to a supporting structure.

The simplest type of edge member is the solid bar (Fig. 1a). Such an edge facing offers high bearing strength as well as high impact resistance. It can be drilled and tapped for fastening. Where shear transfer and fatigue are not criti-

cal, this edge member may prove suitable.

Weight is a possible disadvantage of this design. Also, tooling generally is required for proper alignment of the bars during final cure of the sandwich.

In edging four sides of a panel with solid bar, drill small holes (0.0980 in. diam is suggested) through the bars normal to the panel edge. This allows escape of volatile matter from the adhesive during final cure. For best results, locate these holes about 4 in. between centers. If the adhesives produce little or no volatile matter, no holes are necessary.

Hollow extruded end members (Fig. 1b) may be used if tapping is not required for fastening, or if weight is critical. Such a shape has all the advantages and disadvantages of the solid edge member, with two exceptions. Favorably, it is much lighter. Unfavorably, it lacks the compressive strength of a solid bar.

Install fasteners carefully

Take care in installing bolts and rivets in this type of edge member to avoid panel damage. Use the design only where shear transfer and fatigue are not critical.

To avoid peeling of the panel face from the edge member, substitute a milled shape like that of Fig. 1c. Core material thickness here must be held to close tolerances. Length and width of the facings must also be tightly dimensioned for proper fit.

In panels subject to critical shear loads, shear may be better transferred from core to edge members. Doublers above and below the core at the panel edge will do this (Fig. 1d). The edge resulting is lighter than solid bar, and stronger than the plain hollow extruded bar. It requires under-

cutting the core to allow for the doublers, a disadvantage normally.

If service conditions permit, consider using a polymerizing material, such as an epoxy-base putty, for edge closeout (Fig. 1e). This may be feasible where operating temperature does not exceed 250°F, and where no riveting or bolting is done on the panel edge.

Try putting edges

Puttied edges can be applied to a panel of any shape at any time. They do not require closely tolerated thicknesses in the core material. Polymeric putties are somewhat brittle, and should not be used where panel edges are subjected to high impact loads.

Where impact resistance is demanded, a thin aluminum or plastic laminate plate may be affixed to the panel edge with an elastomeric compound. Before specifying this end closure, make sure operating conditions stay within those specified in the prior paragraphs.

In lightly loaded or nonload-bearing sandwich panels, formed or extruded Z-sections may close out the panel edge (Fig. 1f). This simple closure can be either riveted or adhesive-bonded. It has the disadvantage of requiring close control of Z-section height and core material thickness.

To avoid these tolerance difficulties, check the possibilities of riveted end members. In one type (Fig. 1g), the lower face of the panel is flanged on four sides to form a pan. After final curing, the flanges may be blind-riveted to the flange of an angle.

Use of a doubler (Fig. 1h) with this riveted closure provides greater shear transfer properties.

Chemical milling probably realizes the greatest structural integrity in sandwich panel edges. The

Fig. 3a

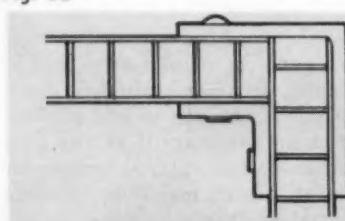


Fig. 3b

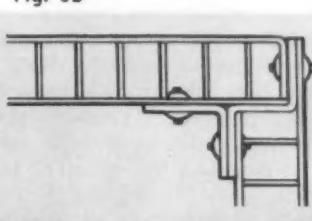
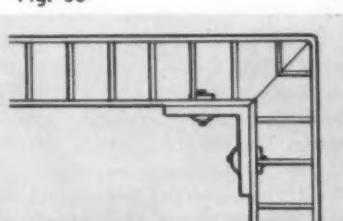


Fig. 3c



"Simple sandwich panel joints exist . . . Some require extruded edge members. Others call for formed sheet metal shapes . . ."

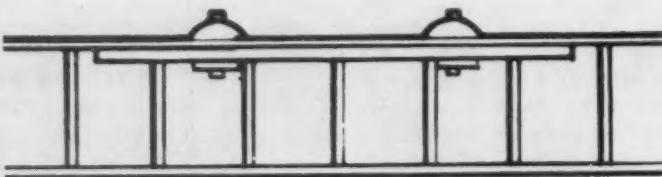


Fig. 4a

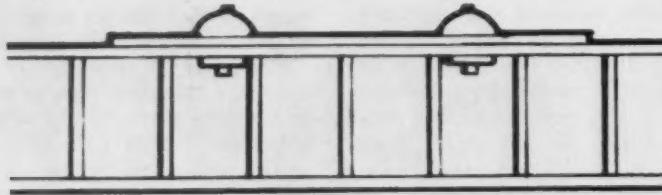


Fig. 4b

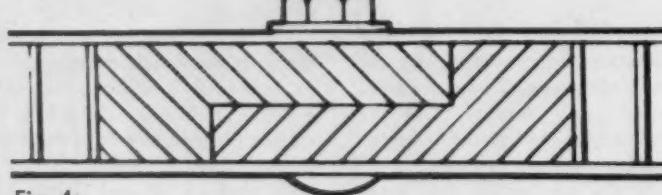


Fig. 4c

Blind rivet (Fig. 4a) helps withstand high local loading. Doublers (Figs. 4b and 4c) spread load at splice over a wider area.

chemical etching process is available through Turco Products, Inc., Los Angeles.

In Fig. 1*i*, chemical milling has eliminated many points of critical tolerances. The core may be fitted to the large chemically-milled radius by beveling the core edge, then compressing to final contour. The Keller duplicator method also may be used for core shaping.

Methods of joining sandwich panels to one another or to a supporting structure are generally developed for a particular application. Despite this, several simple and generally accepted sandwich panel joints exist. Some require specially extruded edge members

(Fig. 2). Others call for fabrication with formed sheet metal or standard extruded shapes (Fig. 3).

Fig. 2*a* shows the design generally used in constructing box-like shapes. It protects all panel edges from any tendency to peel.

Design for disassembly

Lacking an edge member, prefer use of semi-hollow aluminum or steel rivets of proper grip length to avoid panel distortion. With a panel edge member, use bolts of high grip-strength rivets. Basket nuts, nut plates or Rivnuts may allow demounting certain of the panels.

Main disadvantage of the de-

sign in Fig. 2*a* lies in its lack of torsional stiffness at the open end. This may be corrected somewhat by angular or gusset-like stiffeners on the corners of the open end.

In Fig. 2*b*, a specially extruded edge member withstands high internal or external pressure, and permits demounting as well.

Fig. 3*a* shows a double angle method of joining with standard extrusions or formed sheet metal shapes. With semihollow steel or aluminum rivets, no edge member is necessary.

The joint shown in Fig. 3*b* employs panel edges and a flat facing to protect against peeling forces.

By routing the inner face and core material, then folding inward to form a corner, the joint in Fig. 3*c* is produced. This corner is suitable where loads are light—such applications as equipment covers.

Splice panels simply

Edge joining of panels may be accomplished in several ways. Fig. 4*a* illustrates edge joining with milled solid barstock. Where panel length or width exceed standard sheet sizes, splice as shown in Fig. 4*b* or 4*c*. Blind rivets need be used only where high local loads are anticipated.

The doubler shown in Fig. 4*c* may be crushed into position where low density core sandwiches are to be cured in a platen press. Where high density core materials are used, rout out the core.

Inserts fasten equipment to or support structures on sandwich panels. They resist high local loads of the fastening devices and transfer the loads into the sandwich faces.

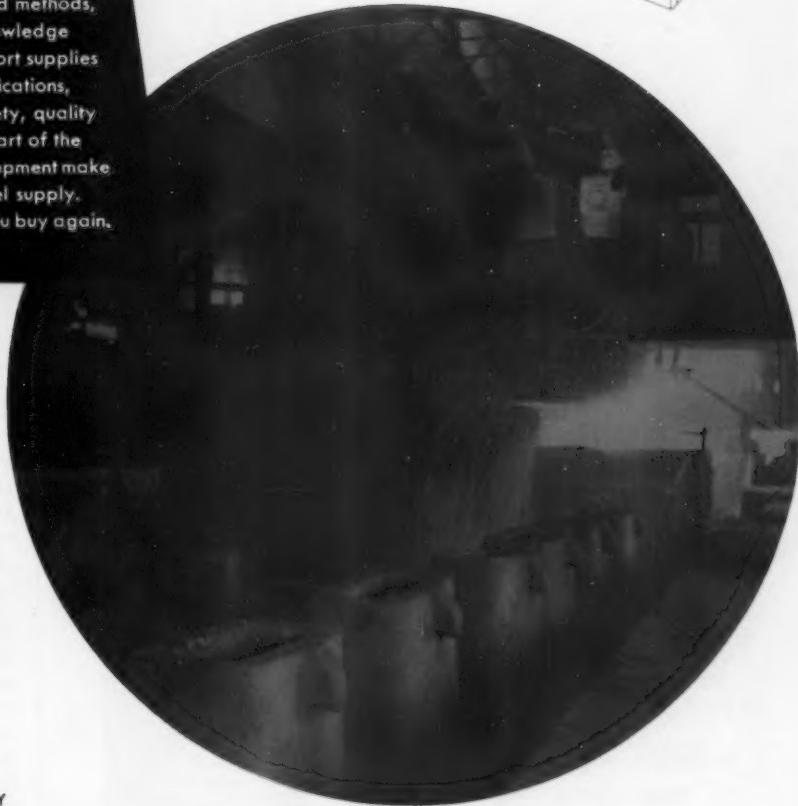
A number of standard and proprietary designs exist. These include inserts of solid metal, and of plastic, or a combination of both. Plastic inserts can be cast in place, often an advantage if service limitations on the material are not exceeded. Inserts may be successfully shaped by chemical milling.

Acme-Newport Steel

FOR MATERIALS HANDLING EQUIPMENT



Acme-Newport is a reliable source for steel for sturdy equipment that short-hauls the goods of America. Just as our products qualify for the manufacture of operating facilities, storage containers and consumer goods themselves. By combining modern equipment and methods, conscientious care and all the knowledge gained in 70 years, Acme-Newport supplies steel to meet your exact specifications, whatever its intended use. Variety, quality and favorable location in the heart of the nation's greatest industrial development make this a most logical source of steel supply. Consult Acme-Newport before you buy again.



ECONOMICAL WATERTRAIL-TRUCK DELIVERY

This Company is ideally situated on the Mississippi-Ohio River system and the great Cincinnati rail-truck hub. New barge facilities, 7 major railroads and 143 motor carriers enable Acme-Newport to give economical, dependable delivery to the entire area of the Middle West and South.



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COMPANY
NEWPORT, KENTUCKY

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PRODUCTS Cold-Rolled Sheets • Hot-Rolled Steel in Coil • Hot-Rolled Pickled Steel in Coil • Hot-Rolled Sheets • Hot-Rolled Pickled Sheets
Electrical Sheets • Alloy Sheets and Plates • Electric Weld Line Pipe • Eave Trough and Conductor Pipe • Culverts

New Technical Literature:

Catalogs and Bulletins

Atomic power

Competitive atomic power and the capabilities of a company to supply reactor power plants are covered in a new bulletin. It features a five-page transvision of a pressurized-water reactor core designed and built for the Army's package power reactor. The firm is building the unit for the Atomic Energy Commission and the Army Corps of Engineers. The 12-page bulletin describes work in the field of atomic power, depicts photographically the package power unit and the company's new criticality facility at Schenectady, and contains a line-drawing of the pressurized-water reactor cycle. *ALCO Products, Inc.*

For free copy circle No. 1 on postcard, p. 113

FOR YOUR COPY

Money-saving products and services are described in the literature briefed here. For your copy just circle the number on the free postcard, page 113.

Drill press

Specifications of a new 20-in. drill press are now available in a bulletin. It describes heavy-duty construction, large capacity features that make the tool applicable for mass-production. A table lists speeds, feeds and capacities. The bulletin lists 28 models: bench, floor and over head units with single or multiple spindles, No. 2 or No. 3 Morse Taper spindles, with hand or power feed, and accessories. *Delta Power Tool Div., Rockwell Co.*

For free copy circle No. 3 on postcard, p. 113

Aluminum

Revised and supplemented information for a company's loose-leaf mill products catalog is now available. These data sheets can be placed in the company's catalog and the old sheets may be discarded. *Reynolds Metals Co.*

For free copy circle No. 2 on postcard, p. 113

Thermistors

Disk, rod, washer and washer assembly Thermistors are covered in a new bulletin. Besides breaking down the cost of each temperature compensating unit in various quantity orders, the publication also lists several "try it yourself" test kits available on Thermistors and Thyrite varistors at special prices for engineering appraisal. *G. E. Metallurgical Products Dept.*

For free copy circle No. 4 on postcard, p. 113

Grinding

Hand grinding techniques, their development and wet grinding are some of the items covered in a new company booklet. It also lists various equipment used in metalworking. Some technical notes on finishing is included, too. *Buehler, Ltd.*

For free copy circle No. 5 on postcard, p. 113

Air valve

A 1½-in four-way valve for zero to 250 psi service is announced in new literature. This valve incorporates a pressure-balanced, self-aligning tubular sealing ring, it says. Since corrosion is a major source of air valve trouble, non-corrosive materials are used for all valve parts. *Barksdale Valves.*

For free copy circle No. 6 on postcard, p. 113

PRICE LIST ON HANNIFIN STOCK HYDRAULIC PRESSES

1-TON	\$ 605
2-TON	\$ 680
5-TON	\$1,530
8-TON	\$1,605
10-TON	\$2,290
25-TON	\$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.



HANNIFIN

HANNIFIN CORPORATION, 513 S. WOLF ROAD, DES PLAINES, ILLINOIS

Arc rectifier

Design features of mercury arc rectifiers which provide power conversion in steel mills, transportation systems and other applications, are described in a new bulletin. As described, pump evacuated or sealed tube mercury arc rectifiers have a fixed excitation anode, continuous excitation, grid phase control, internal cooling system, arc-over-free tank and enamelled anode seals. *Allis-Chalmers Mfg. Co.*

For free copy circle No. 7 on postcard, p. 113

Grinding wheels

Crankshaft grinding wheels for production use in automotive type engine plants are covered in a new bulletin. It includes information on multiple spindle set-ups for grinding main or line bearings, and for single wheel set-ups for pin bearings. Also contained is data on re-grinding automotive crankshafts in the automotive service trade and production grinding wheel specifications for camshaft grinding. *Simonds Abrasive Co.*

For free copy circle No. 8 on postcard, p. 113

Cold header

Now available is a specifications sheet describing a fast solid die double stroke cold header. It covers the machine's features which enable it to head rivet and screw blanks at rates of 300 to 450 per minute. Advantages of the toggle type construction used for actuating the heading gate are explained. The machine is illustrated and a table of specifications is provided. *Waterbury Farrel Foundry & Machine Co.*

For free copy circle No. 9 on postcard, p. 113

Shaded-pole motors

Shaded-pole motors for fan and blower applications in ratings 1.5 w through $\frac{1}{4}$ hp are described in a dozen page publication. It contains application, rating, and dimension data on: 5½-in. motors rated 1/12 through $\frac{1}{4}$ hp, 5-in. motors rated 25 mhp through 1/12 hp, 4-in. motors rated 15 mhp through 35 mhp, and 3½-in. motors rated 1.5 through 16 w. It shows product features and lists accessories available. *General Electric Co.*

For free copy circle No. 10 on postcard, p. 113



in fact...forged to be ahead

Forging has long been recognized as a superior method for producing tool steel billets from ingots. This more thorough working is one of the steps that makes possible tool steels which are capable of maximum toughness and performance. *It helps you produce your finest tool steel products.*

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Vulcan Tool Steels are available in all types, shapes and sizes. See your Vulcan representative, or write for Vulcan Tool Steel Data.



Vulcan Crucible Steel Division

H. K. Porter Company, Inc.

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Offices and warehouses in principal cities

FREE TECHNICAL LITERATURE

Carbide grades

A new Carbide Grades Chart of carbide grade recommendations shows grades and numbers of twelve manufacturers. *Chicago-Latrobe.*

For free copy circle No. 11 on postcard, p. 113

Mechanical seal

Precision hand tools to prepare pump stuffingboxes for mechanical seal installations are reviewed in recently issued reading matter. It describes a tool that prepares a smooth gasket surface on the stuffingbox end to assure proper mechanical seal performance. "A mechanical seal, properly installed, eliminates stuffingbox repacking and maintenance and solves problems of leakage on most pumping services. With this new refacing tool the user can reface and install a mechanical seal quickly, easily and inexpensively," the company states. *Byron Jackson Pump, Inc.* For free copy circle No. 12 on postcard, p. 113

Temperature control

Bulb-and-capillary indicating temperature controllers are illustrated in a brochure now available. It describes how the user can tailor a controller to his specific operating requirements by selecting from the proper "building blocks." Choices include three temperature ranges, three bulb sizes, single or dual control circuits and four basic switch types to meet various electrical load requirements. *Fenwal Inc.*

For free copy circle No. 13 on postcard, p. 113

Oxide tools

Speeds and feeds for oxide cutting tools are recommended in a new brochure. It covers hundreds of materials in all classes and proper tools for working these. The metal, its Brinell hardness number, speed (spfm), feed (ipr) and machineability ratings are listed in chart form. These are given for: plain carbon and alloy steels, heat-treated alloy steels, tool steels (annealed), cast iron, nickel alloys (cold drawn), copper alloys, aluminum alloys, magnesium alloys and plastics. *Diamonite Products Div., United States Ceramic Tile Co.*

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Imitation, they say, is the most sincere form of flattery. Well then, it's small wonder that we're flattered.

Ever since 1939 when we developed and introduced MALLEABRASIVE, it's been imitated. Yes, imitated—but never equalled!

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So—in plant after plant, MALLEABRASIVE continues to prove itself—continues to prove by daily production cost records that it cleans at lower cost—continues to prove that there is only one genuine Malleabrasive.

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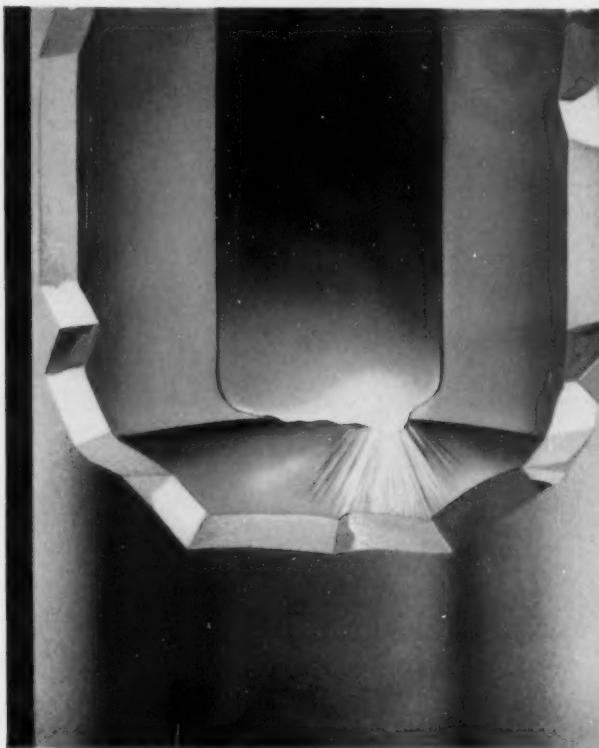
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ARC FURNACES



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Designed by Engineers Who OPERATE Them!

With an NRC Vacuum Arc Furnace you can now melt — economically and reliably — refractory and reactive metals and alloys. Because each of these metals behaves differently, satisfactory design of vacuum arc furnaces is unusually dependent upon operating experience. Built into your NRC Vacuum Arc Furnace are features which result from the inti-

mate familiarity gained from building and operating such units for more than a decade. For instance, the extra-safe NRC mold design reduces the danger of mold burn-through.

If you are considering the purchase of a vacuum arc furnace — laboratory, pilot plant, or production size — we would like to point out the design features of an NRC furnace which will assure you dependable, efficient, and safe operation. Use the coupon below.

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**WHAT'S
BEHIND
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Electric arc furnaces represent the greatest degree of refinement of any steel-producing method. The more rigid metallurgical control possible in the electric furnace assures the highest, most uniform quality in every heat. The versatility of the electric furnace makes possible the production of many steels required to serve a diversified market. The electric furnace has made the Copperweld trademark a symbol of the finest steels you can buy.

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FREE TECHNICAL LITERATURE

These publications describe money-saving equipment and services . . . they are free with no obligation . . . just circle the number and mail the postcard.

This section starts on p. 108.

Metal parts

Corrosion-resistant fastenings are illustrated in a new 24-page semi-technical brochure. A process of designing special parts, determining the alloy best suited to the particular job, and then manufacturing the part from molten metal to finished fastenings is covered. The brochure describes some of the thousands of special fastenings which are being produced in small quantity for individual jobs and in large quantities for original equipment manufacturers. *H. M. Harper Co.*

For free copy circle No. 15 on postcard

Rail conveyor

Fixed and portable wheel conveyors are easy to set up, adjust and put away. A folder now available recommends the rail wheel conveyors for moving, loading, unloading and "live" storing packages with a smooth, flat bottom. The literature illustrates their efficiency and uses with many photographs of actual applications. *The Alvey-Ferguson Co.*

For free copy circle No. 16 on postcard

Aluminized fence

Applications of aluminized fences, their special features and styles are listed in a four-page bulletin. It offers information on chain link fence of aluminized fabric and aluminized barbed wire. The protective aluminum coating, bonded to steel wire, will not wash away as it oxidizes. It will remain for years of service where abnormal corrosive atmospheres may be present, the bulletin states. *Page Steel & Wire Div., American Chain & Cable Co., Inc.*

For free copy circle No. 17 on postcard

A 4-in. concentric grinder is described in a folder now available. This is a shoe-type centerless grinder for ring shaped parts with either straight or profiled shapes. Automatic grinding of small parts is economical with this type machine, it says. *Landis Tool Co.*

For free copy circle No. 18 on postcard

Beryllium strip

Heat treating curves for beryllium copper strip are included in a specifications bulletin of the same name. It covers proper heat treatment, tempers supplied, age hardening and new developments in heat treating of the strip. *Penn Precision Products, Inc.*

For free copy circle No. 19 on postcard

Gears

Numerous types of gears available from one manufacturer are listed in a brochure presently obtainable. It covers types and sizes of gears made. Operations available to make gears to additional specifications are included. Advantages of multiple splined shafts are also given and discussed. *The Adams Co.*

For free copy circle No. 20 on postcard

Suspended magnets

Suspended separation magnets for positive removal of tramp iron in conveyor systems are described in a new bulletin. How to select the proper size of rectangular suspended separation magnets is covered. Specifications and operating principles of various types are presented in convenient form. *Stearns Magnetic Products Div., Indiana Steel Products Co.*

For free copy circle No. 21 on postcard

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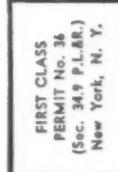
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THE IRON AGE
Post Office Box 77
Village Station
NEW YORK 14, N.Y.

FREE TECHNICAL LITERATURE

Lube distribution

Distribution systems for automatic lubricators are described and illustrated in a 12-page brochure. Reservoirs, tubing, fittings and junctions are discussed in separate sections. Other sections deal with oil distribution and how systems are engineered to provide correct oil film to individual lubrication points.

Bijur Lubricating Corp.

For free copy circle No. 22 on postcard

Furnaces

Twenty-seven standard rated surface heat treat furnaces are listed in a folder. It illustrates a large variety of standard equipment for all types of industrial heating applications. Small laboratory furnaces and large continuous brazing furnaces are described. *Surface Combustion Corp.*

For free copy circle No. 24 on postcard

Collapsible taps

Collapsible taps are covered in a new bulletin. These receding chaser collapsible taps are designed for application to special heavy duty vertical tapping machines. Primarily used for the taper threading of oil tubular goods, they can be equipped with a special cam slide for straight tapping operations. *Landis Machine Co.*

For free copy circle No. 27 on postcard

Barrel finishing

Precision barrel finishing on small, intricate runs is performed with a new barrel finishing unit. So states a data sheet now available. It cuts production costs 80 pct in some cases, the literature states. Weighing 115 lb, the unit has an 8 x 8-in. barrel. It is powdered by a 1/3 hp, 110 v, single phase motor. *Spee-D-Burr Corp.*

For free copy circle No. 28 on postcard

Aluminum jackets
Aluminum insulation jacketing for tanks, vessels and piping systems is covered in a manual now available. The 40-page publication gives recommendations for selecting, fabricating and installing aluminum jacketing components. Many photographs, drawings and tables are included. *Kaiser Aluminum & Chemical Corp.*

For free copy circle No. 29 on postcard

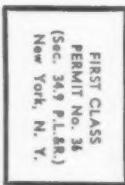
Surface plates

Manufacture of black granite surface plates is described in a new edition of a technical manual. This illustrated 78-page book tells how surface plates are made; how they are lapped down to fifty-millionths overall accuracy; how this overall accuracy is guaranteed by inspection. *Collins Microflat Co.*

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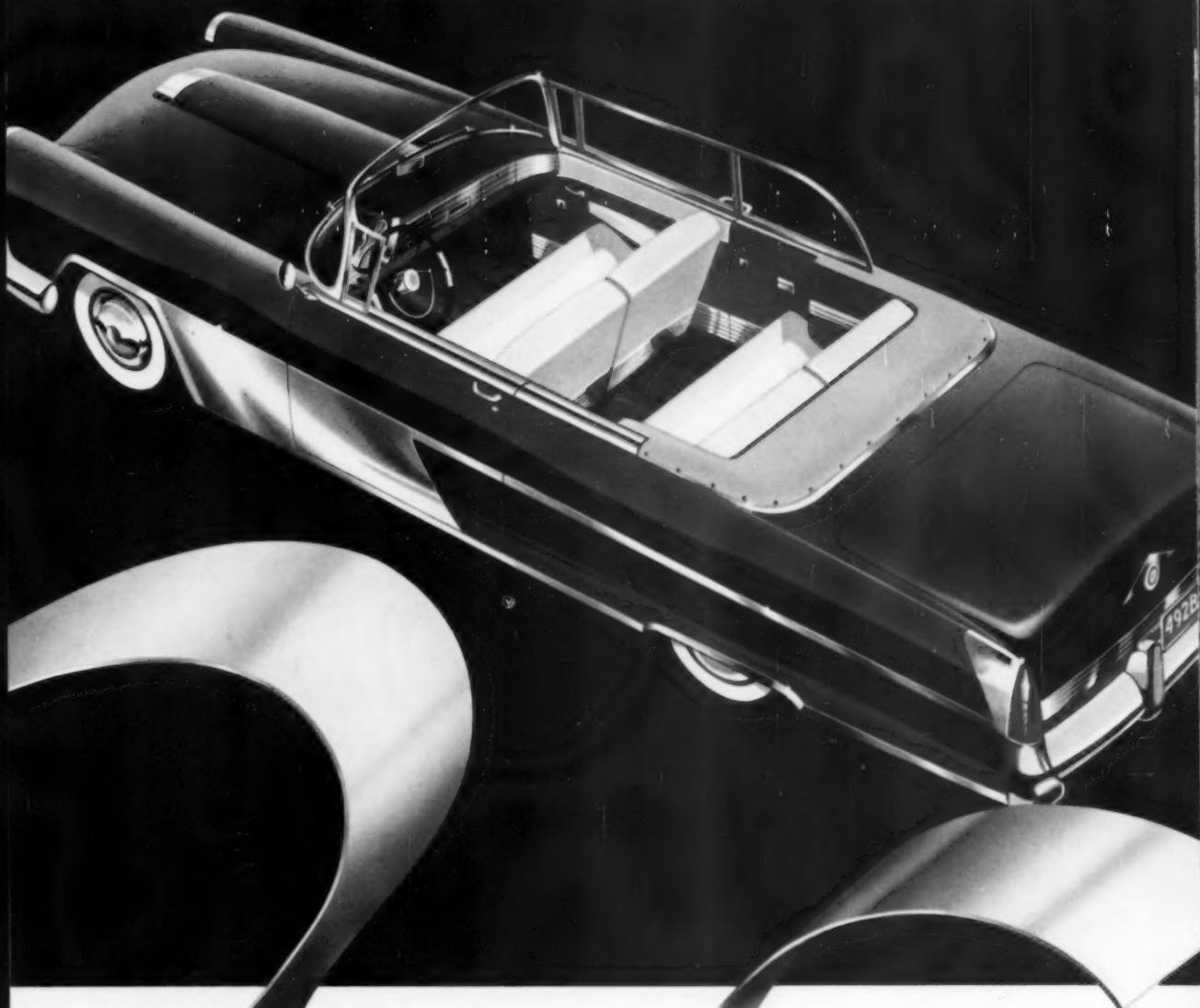
Truck casters

Industrial truck casters and materials handling equipment is covered in a new 68-page catalog. It contains information on selection of the right casters for a particular job. This is followed by 40 pages of descriptive material, illustrations and specification data on all types of Casters together with details on caster wheels and accessories. In addition, it includes information and specifications on materials handling products. *Bond Foundry & Machine Co.*

For free copy circle No. 25 on postcard

the bright spots

in any automobile picture



FUNCTIONAL AND

DECORATIVE TRIM OF

stainless steel

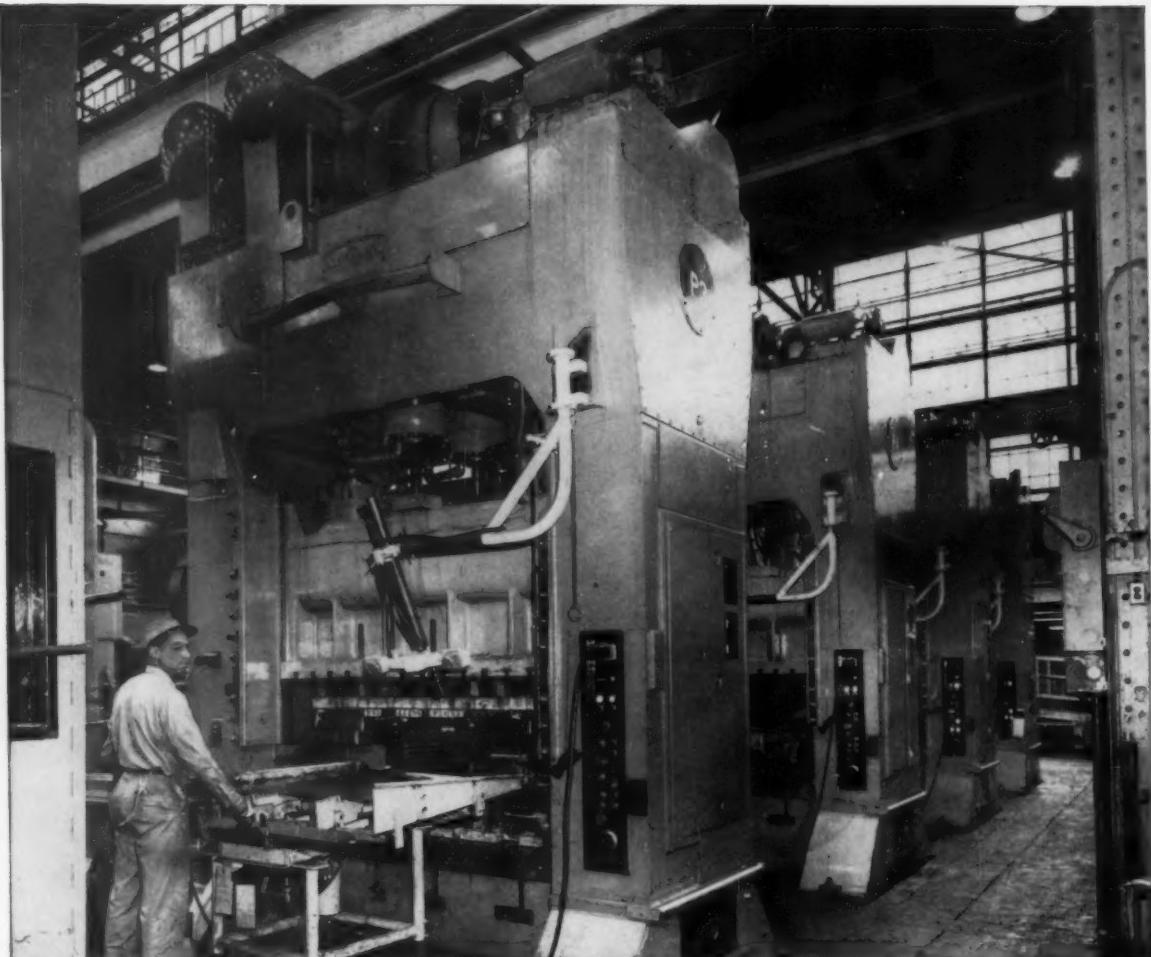
BRIGHTWORK of time-proved stainless steel sparkles invitingly on the car dealer's floor . . . shines as it serves, year after year . . . gleams like new when the car is old! For built-in luster that foils corrosion, plus super-strength to resist dents and scratches, design and specify STAINLESS STEEL . . . the quality metal that speeds acceptance of your cars—on first sale and resale!

Superior

stainless strip steel

Superior Steel

CORPORATION
CARNEGIE, PENNSYLVANIA



Dependable CLEVELAND Presses Hold Automotive Stamping Costs Down!

These four Cleveland Presses recently installed at a leading automotive stamping plant are further testimony of the dependable performance built into every Cleveland Press. Their selection clearly indicates their ability to produce low cost stampings on high production schedules . . . indicates their ability to "stand up" under the demands of round-the-clock operation.

You, too, can earn extra profits by investing in new, more efficient Cleveland Presses. You'll find that the instant response and exact control made possible with the patented Cleveland Clutch speeds operation . . . reduces rejects. Their extra rugged construction assures reserve capacity . . . lasting slide alignment for continued accuracy. One of the 11 specialized types of Cleveland Presses is sure to be your answer to greater stamping economy. Write or call today!

THE
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PUNCH & SHEAR WORKS CO.

Established 1880

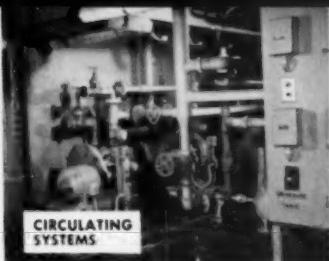
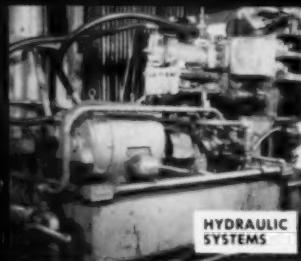
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SUN SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

Moderately priced...low in carbon-forming tendencies, Sun Solnus® oils simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several*. Their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price all add up to "more lubrication per dollar."

For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.

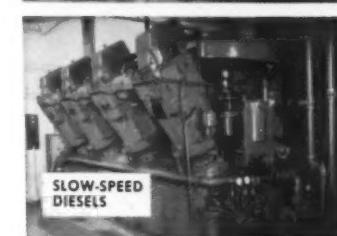
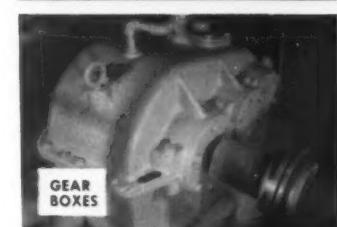
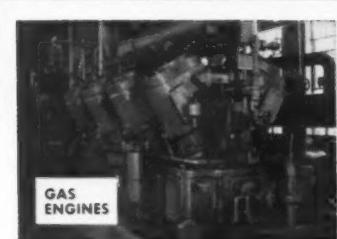


INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY
PHILADELPHIA 3, PA.

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In Canada: SUN OIL COMPANY LIMITED, Toronto and Montreal





Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

Equipment: A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

Test: The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

Results: Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.



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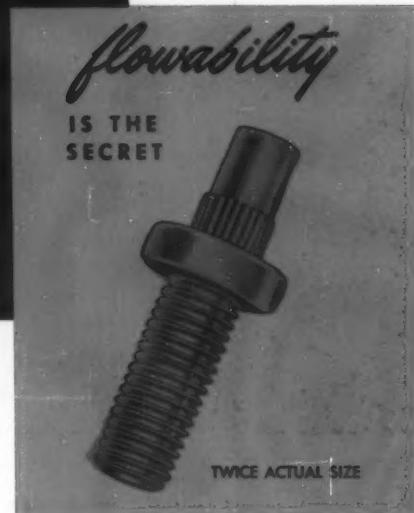
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Tough cold heading jobs... *longer runs...lower costs*

CENTRAL SCREW CO. of Chicago, Illinois, tackles many intricate cold heading jobs. A few are illustrated. All are processed from Keystone "XL" Wire. The auto horn mounting stud, shown in the color panel, was a tough forming job, upset in two blows. After trying other wires, Central Screw Co. changed to Keystone "XL" Wire and successfully produced this part with much longer runs due to increased die life. Rejections were cut to a minimum. The result—a quality finished product at a lower cost.

KEYSTONE
WIRE FOR INDUSTRY



Time and again, quality Keystone "XL" Cold Heading Wire has made it possible to perfectly form the most intricate fasteners or parts. A Keystone Wire Specialist will gladly discuss your problems and make recommendations. Your inquiry is invited.

Keystone Steel & Wire Company, Peoria 7, Illinois



KEYSTONE STEEL & WIRE COMPANY
Peoria 7, Illinois

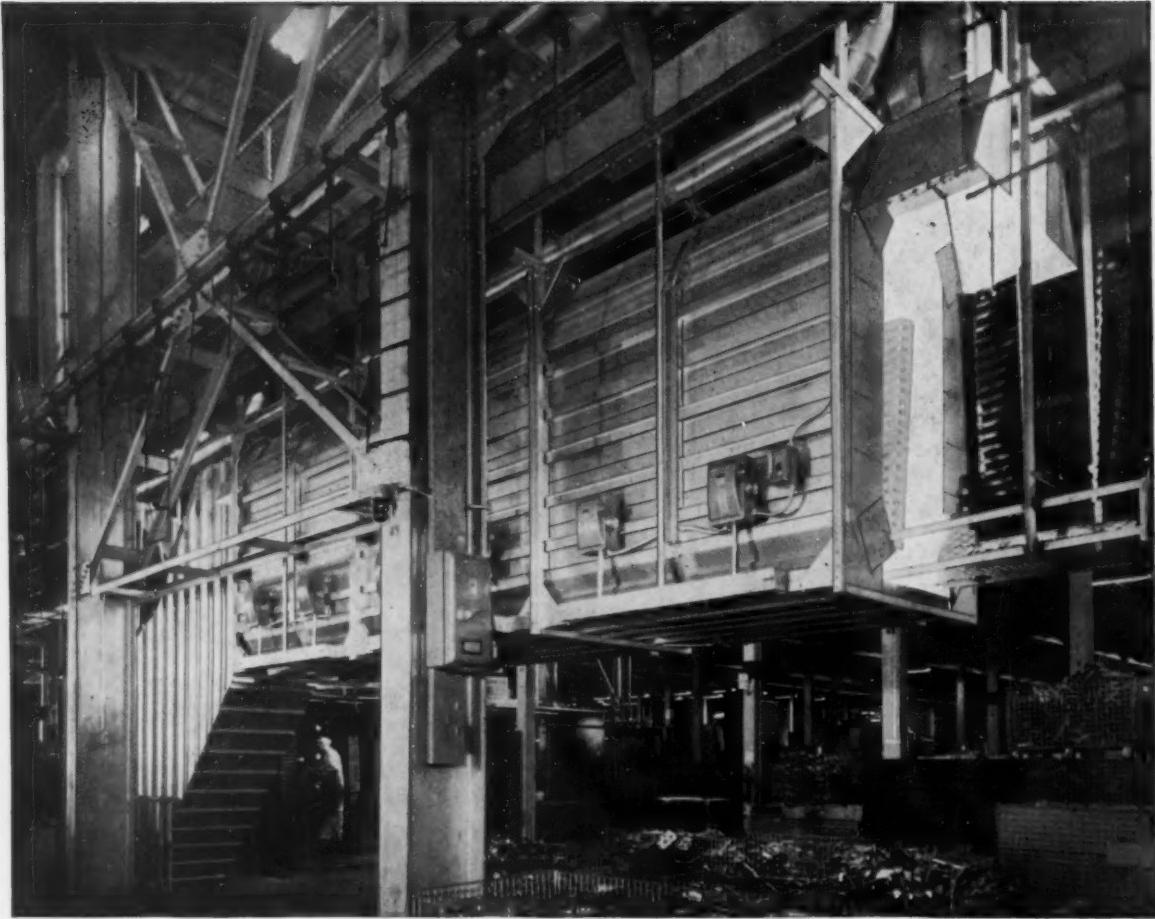
Mail coupon for free booklet—
COLD HEADING FACTS! Discusses methods, technical facts, wire requirements and other data.

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Company _____

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Fostoria Radiant Oven at Westinghouse, Columbus, Ohio

PROCESSES 24,000 PARTS EVERY WEEK

It takes only 15 minutes to dry refrigerator back-plate condensers for stacking—at the Columbus, Ohio Westinghouse plant, a recent addition to the company's Electric Appliance Division.

Using a fast-drying Fostoria Radiant Oven, this modern plant is able to process 10,000 to 12,000 condensers for major appliances, plus the same number of miscellaneous small parts, every 5-day week. In

thousands of similar industrial applications, Fostoria Radiant Ovens speed up production, save valuable man-power . . . and cut operating costs as much as 50%. Fostoria design permits overhead installation to save work space (as shown above) and allows easy relocation, if necessary. Want to know how an efficient Fostoria Radiant Oven can save money and improve product quality *for you?* Send for complete details today!

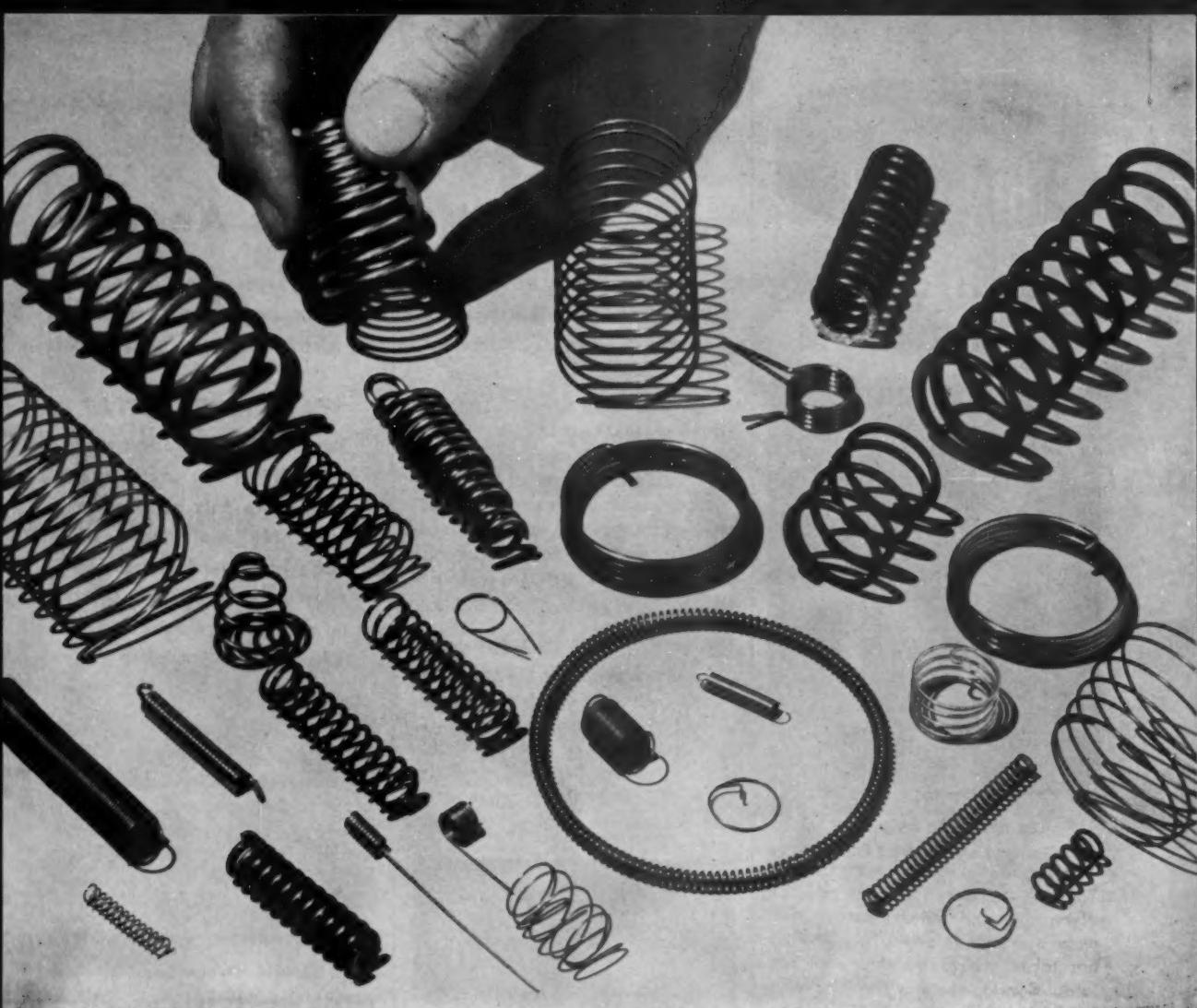
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FOSTORIA PRESSED STEEL CORPORATION • Dept. 1124, Fostoria, Ohio
Pioneer manufacturer of radiant equipment—from components to complete ovens



How the right "COAT" solves many spring problems

• Unless you yourself go in for forming wire springs, you have no idea what a tricky business it is. For one thing, as every fabricator knows, it takes extreme uniformity in the wire to obtain the precise dimensions and the exacting tension, torsion or compression characteristics so often required.

But uniformity alone won't always do the trick! As a leading supplier of special wire for tougher-than-usual spring requirements, National-Standard has delved deep into production problems and has come up with answers that help many a fabricator hold better to tough specifications and produce faster with less waste

and more profit!

Time and again, for example, National-Standard has shown that merely a change in wire *coating* or lubrication quality is of major importance in forming operations. Proper coating also helps gain uniform dimensional response to heat treating. Quite often, in fact, troubles chalked up to wire variance are really the fault of improper coating or finish.

Helping fabricators solve problems and cut costs is a National-Standard specialty. We're geared for it and make a point of it. Try us and see!

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
Tire Wire, Stainless, Fabricated Braids and Tape

ATHENIA STEEL DIVISION • CLIFTON, N. J.
Flat, High Carbon, Cold Rolled Spring Steel

REYNOLDS WIRE DIVISION • DIXON, ILLINOIS
Industrial Wire Cloth

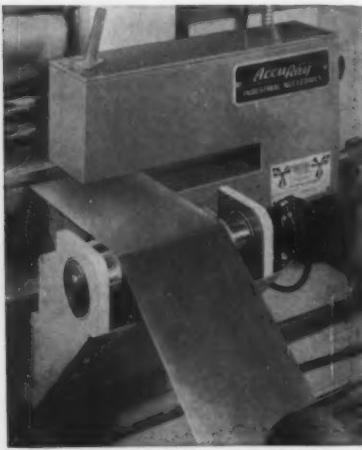
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Special Machinery for Metal Decorating

WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
Round and Shaped Steel Wire, Small Sizes





UNIFORM AS THE ATOM



Somers Thin Strip now
Gauged by Nuclear Energy

To meet the increasing demands of electronics and other industries for uniform closer tolerances, Somers Brass has taken advantage of one of the latest developments in the electronic field by installing the first Accu-Ray gauges in the non-ferrous industry. These units make it possible to check and control thickness from edge to edge throughout each coil to a degree of accuracy never before known.

Accu-Ray gauging is typical of the modern methods Somers combines with engineering experience to provide thin strip metal to your most rigid specifications. Nickel, Monel, and Nickel Alloys from .020" to .00075". Brass, Bronze, Copper and Alloys from .010" to .00075".



Somers Brass Company, Inc.
102 BALDWIN AVE., WATERBURY, CONN.

TECHNICAL BRIEFS

TESTING: Stress Analysis

Researchers observe pressure vessel stresses by duplicating steel structures in plastic . . . Photoelastic resin model undergoes same stresses . . . Patterns become visible under polarized light.

Application of a special plastic allows researchers to observe complicated stresses existing in pressure vessels. Formally called "photoelastic stress analysis," the process greatly simplifies vessel study and design. This is done by making the stresses actually visible.

Shows Under Polarized Light

An exact model of the structure to be studied is constructed from a photoelastic resin. Such materials have the ability to visibly show twisting, bending, or other stresses they undergo when various forces are applied to them.



Researcher examines "frozen-in" stress patterns.

When examined under polarized light, the stresses show up as patterns of colored light.

One vessel, a large steel structure which houses a nuclear power plant's reactor core, has been completely duplicated in the plastic. Its builders, the Westinghouse Electric Corp., say this helps speed pressure vessel design and insures that the structure can easily withstand any pressures it may be called upon to contain. The present system under

WANT MORE DATA?

You may secure additional information on any item briefed in this section by using the reply card on page 113. Just indicate the page on which it appears. Be sure to note exactly the information wanted.

study being of the "pressurized water" type, it must withstand superheated steam under pressures to 2000 psi.

The plastic pressure vessel model is about 2-ft high by 1½-ft in diameter and weighs about 100-lb.

Duplicates Stress Patterns

After the model is cast, it is machined to exact shape. Air is then pumped into the model until it is under a pressure of about 4-psi. This is large enough to produce in the model the exact stress patterns existing in the actual vessel under its working pressure of about 2000 psi.

The model is then cured by heating. This "freezes" the stress patterns permanently into its walls. Samples are cut from the model and examined under polarized light. The "frozen" stresses can then be studied rapidly with great precision.

Corrosion:

Hollow spheres float on acid, resist fumes.

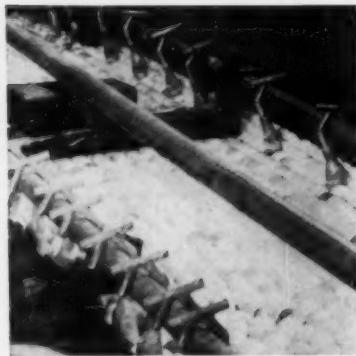
Hollow spheres molded of polyethylene smother corrosive and noxious fumes by floating on top of acid solutions. Moreover, they

resist almost indefinitely the acid they float on.

Ordinarily, gas bubbles rise to the surface of metal plating solutions and burst. This throws a fine, corrosive mist into the air. To avoid this, Cosom Industries, Inc., Minneapolis, Minn., developed the spheres to form an evenly spread blanket over the tank's surface.

Won't Lodge In Work Spaces

The spheres are about 1½-in. in diameter. This size was selected so that the spheres are not so small as to lodge in the recesses of work spaces. Nor are they so large as to leave much space between them when tightly



About 55 of the spheres per sq ft completely covers the tank.

packed. They roll over one another when forced together. This prevents rafting together to exposing portions of the solution.

A dense and even blanket, to control the escape of acid fumes and splashing, requires about 55 spheres per sq ft.

While used mainly to control acid fumes, they also help maintain uniform temperatures in some plating bath applications.

Methods:

**Wire thread inserts
replace bushings.**

A new method of obtaining metallic threads in grinding wheels uses a stainless steel wire thread insert.

Coated with cement on the out-

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Automation GAGING Systems

ALL-NEW Metallurgical Laboratory

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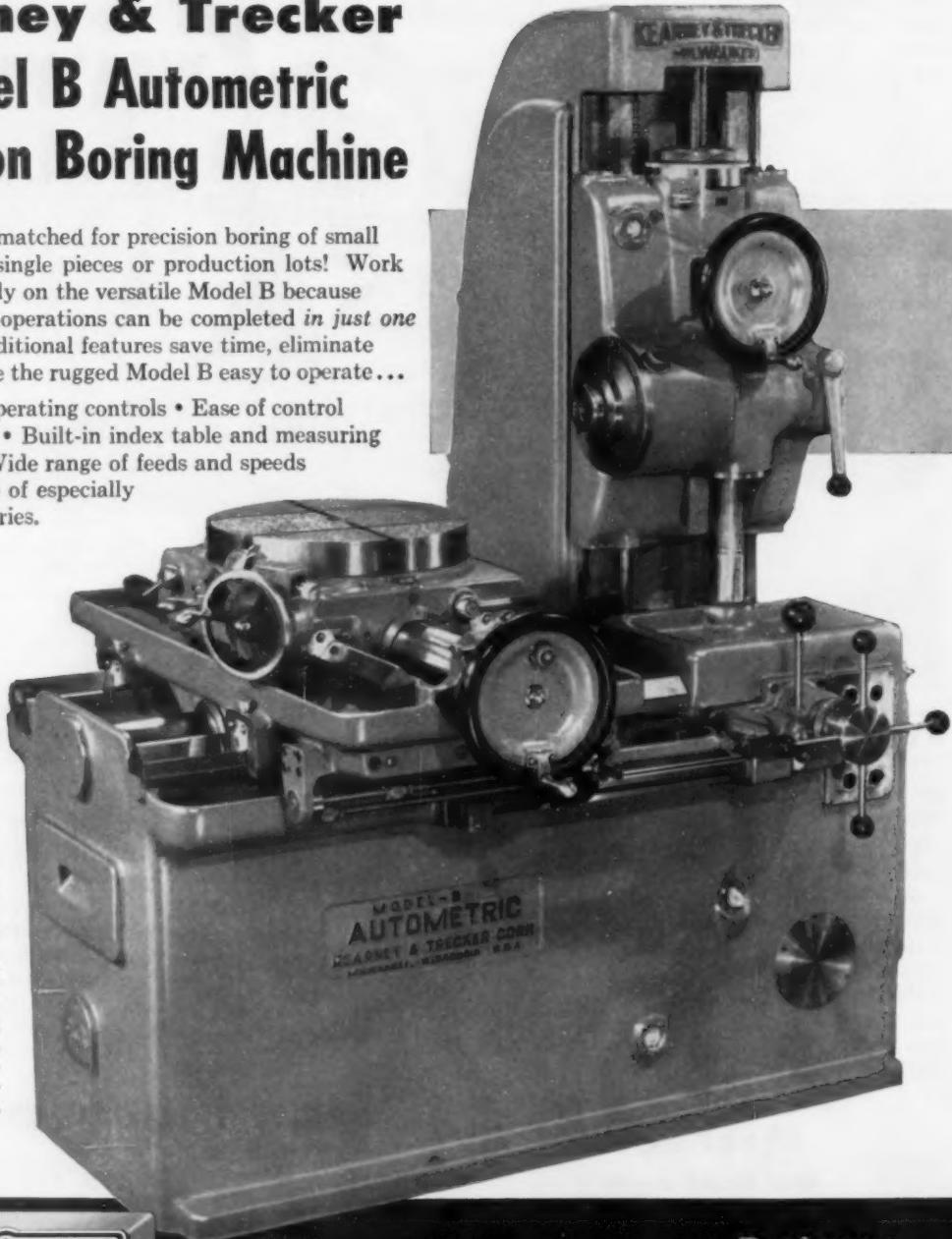
Speed Precision Boring

and maintain accuracy of .0002" in 12" with the

Kearney & Trecker Model B Autometric Precision Boring Machine

Here it is... unmatched for precision boring of small work... either single pieces or production lots! Work progresses rapidly on the versatile Model B because multiple boring operations can be completed *in just one setup*. These additional features save time, eliminate errors, and make the rugged Model B easy to operate...

- Convenient operating controls • Ease of control
- Ease of setup • Built-in index table and measuring instruments • Wide range of feeds and speeds
- Complete line of especially selected accessories.



Model B Auto-metric: 16" dia. table; 10" Vert. Travel; 16" Transverse Travel; 15" Carriage Travel; 8 speed changes—.0005" to .0148" per Spindle rev.; 50 to 2500 rpm. For complete details, ask for Catalog No. BMA-10.

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side only, the insert is placed in the grinding wheel and allowed to harden. Inserts used in this application are manufactured with the coils in contact with one another to prevent the passage of cement to the internal threads. For convenience the insert is pushed into the hole on a simple shouldered mandrel.

Inserts for this type of application sometimes come with right



Insert cemented in abrasive wheel's center fits on shaft.

or left hand threads, of stainless steel, carbon steel or bronze wire material.

This wire insert method of providing threads replaced the use of solid brass bushings, also secured with cement.

Steelmaking:

Oxygen production to double
in two years.

New installations under way or soon to be started by one oxygen producing company will almost double the nation's oxygen output. This will be accomplished in only about two years.

Approximately 30 installations increasing oxygen production capacity by nearly 2 billion cu ft per month have been constructed or contracted for by Linde Air Products Co. Most of them are on or near steel mill property.

Many of the new installations are high-purity gaseous oxygen producing units ranging in capacity from about 7 to 100 million cu ft per month.

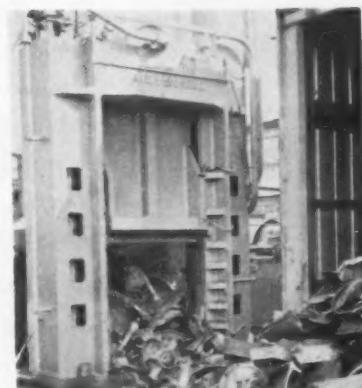
Handling: Hydraulic shear tackles scrap cutting job.

A new hydraulic shear may soon be taking over the costly and difficult job of cutting steel scrap.

Made by Harris Foundry & Machine Co., Cordele, Ga., the new shear cuts 4½-in. rounds and 1 in. plate. Cutting and feeding operations are automatic. A hydraulic ram forces loose scrap in a V-shaped hopper under a vertical-travel blade. Hydraulic pressure forces the blade downward in a cutting, rather than a chopping, stroke.

Chews Scrap Quickly

In its initial demonstration the shear handled a scrap assortment that included axles, boiler tubes, plate and others. In a period of about seven minutes, it chewed up the scrap from two feed bins. Dealers viewing the demonstration estimated it would take six men to cut the same amount of scrap by conventional methods.



This shear cuts 4½-in. rounds and 1-in. plate in scrapyards.

Baling and other phases of scrap handling have become highly mechanized in recent years but shearing has remained a hazardous operation involving a lot of manual labor. One dealer estimates that cost of shearing a ton of scrap has risen from \$1.20 to over \$9 since the war.

More extensive tests are scheduled for the hydraulic shear.

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*Chief
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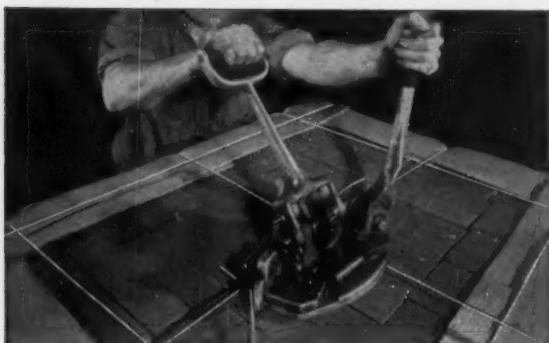
"*Analysis of Work Stoppages, 1955*," presents information relating to major issues, industries affected, geographic patterns, unions involved, trends during the year, size and duration of work stoppages, and method of terminating the stoppages. 34 pp. 30¢ per copy. Catalog No. L 2.3:1196. Supt. of Documents, Govt. Printing Office Wash. 25.

"*Oxygen In Iron And Steel Making*," by Charles, Chater, and Harrison is possibly the most complete treatment of the subject in a single volume. This book is intended to fill the needs of both shop and engineering personnel. Starting with general theoretical considerations, it systematically covers the applications of oxygen to Bessemer, open hearth, and electric furnaces. Special sections deal with blast-enrichment with oxygen in solid fuel combustion and flame enrichment. 309 pp. Inter-Science Publishers, Inc., New York.

"*Chromium, Vol. 2*": Edited by M. J. Udy is a companion piece to a first volume which covered the chemistry of chromium and its compounds, this book concentrates on the metallurgy of chromium and its alloys. Those sections which review the recovery of chromium from its ores and the use of chromium in refractories will be welcomed for their carefully organized treatment of these subjects. A section dealing primarily with the alloys of chromium does not appear to materially improve upon earlier work sponsored by the Engineering Foundation. 402 pp. \$11 per copy. Reinhold Publishing Corp., 430 Park Ave., New York 22.

"*Metallurgy*," by Johnson and Weeks (fourth edition) is a practical survey work concerned primarily with physical metallurgy. Selection and application of metals in modern industry is covered. It includes an entire new chapter on titanium, zirconium, indium and vanadium. 454 pp. Over 100 photomicrographs. \$5.50 per copy. American Technical Society, 848 E. 58th St., Chicago 37, Ill.

How USS GERRARD speeds handling—cuts costs



"We have been able to cut handling time, give our customers better service, balance our work load, save storage space, and reduce brick breakage through the use of USS GERRARD Round Steel Strapping," says Glen-Gery Shale Brick Corporation of Reading, Pa., largest building brick manufacturer in the East. Glen-Gery uses 12-gauge USS GERRARD Round Strapping to package bricks in easy-to-handle units of 500.



"We rely on USS GERRARD Strapping to get our houses to the building sites in perfect condition," says West Coast Mills, Chehalis, Washington, manufacturers of prefabricated Far West Homes. These attractive prefabs are shipped all over the United States by rail and truck, bundled securely with USS GERRARD Round Steel Strapping. They arrive consistently at the building sites with every piece intact.



"We reduced handling time by 75%, increased storage space by 33%, and cut shipping damage to less than 1%, by palletizing our tuyeres with USS GERRARD Flat Steel Strapping," says Climax Fire Brick Company of Climax, Pa., producer of 60% of the nation's requirements for these odd-size Bessemer Furnace fire bricks.



Waterproof-wrapped for shipment, this coil of sheet steel is being reinforced with USS GERRARD Flat Steel Strapping. Notice how strip of strapping inside coil exerts outward tension, keeping protective paper in place.

Bring your packaging-tying problems to USS GERRARD. Regardless of what they are, our engineers will help you find the safest, surest, most economical solution to them.

NEW CATALOG—HOT OFF THE PRESS! 36 pages of photographs, descriptions, facts and figures on all USS GERRARD Steel Strapping and associated equipment.

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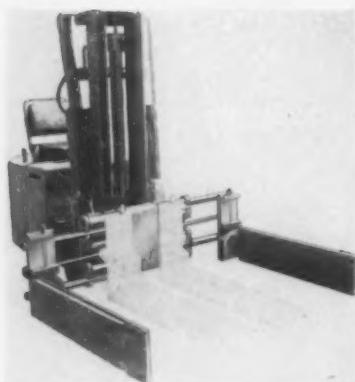
Company

Address

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NEW EQUIPMENT

New and improved production ideas, equipment, services and methods described here offer production economies...for more data use the free postcard on page 113 or 114.



Clamp attachment handles pallets or palletless loads

Clamp and grip-arms can now be installed on electric fork trucks. These trucks may be used either for palletless handling by clamping the load, or for pallet handling by using the clamping arms as forks. Clamping arms rotate 90° to permit both operations. When used as a clamp, the maximum adjustment is 63 3/4-in. between arms. The minimum is 16-in. Pallets of widths as little as 30-in. may be handled when using the setup as

forks. The maximum adjustment outside the forks is 70 3/4-in. The minimum is 23-in. Arms of the clamp are lined with rubber. The clamp itself is equipped with an adjustable pressure relief valve to prevent load crushing. All controls are conveniently located in one area directly adjacent to the operator's seat. Clamps are available on walk and rider-type trucks. *Louis Shepard Products, Inc.*

For more data circle No. 31 on postcard, p. 113



Lead measuring instrument features high amplification

High amplification allows an electronic lead measuring instrument to make close tolerance inspection readings. Used for detecting lead error in straight and tapered work and rack teeth, it is available with highly accurate drift-free dual electronic amplification of either 1000/2000 or 2500/5000 to 1. Amplification within each dual range can be switched from one to the other without realignment of the indicating meter. Where amplifica-

tion is 5000 to 1, direct readings on the zero center equalizer scale can be made to 0.00001-in. It will handle work up to 36-in. long and 10-in. in diameter with standard tailstocks. Used with a V-block accessory, any length work with diameters from 1/2 to 6-in. can be checked. The instrument is approximately 59-in. long, 24-in. wide and 51-in. high. Power is 110 v., 60 cycle ac. *The Sheffield Corp.*

For more data circle No. 32 on postcard, p. 113



Hydraulic tube bender makes four bends with each stroke

Capable of making two bends in each of two or more tubes, a vertical ram-type press bends two different angles in the same "U" frame. It incorporates a self-contained hydraulic system built for continuous production. With a rated capacity of 6-ton, the press' full ram tonnage is available for bending. This is possible because the center clamp moves with the ram. Cushion pressure does not oppose the ram tonnage. The machine has twin equalizing cushion cylinders, variable speeds, single

adjustment for wing dies, retracting ram dies, and changeable wedge inserts for wedge dies. It may be used on steel and nonferrous tubing. The press accommodates continuous bending of 1-in. OD steel tubing. Excessive flattening and wrinkling is prevented and ovalization in the bend is cut down with the unit. Since four or more bends can be made with each ram stroke, production is high (1700 to 3000 bends per hour). *Pines Engineering Co., Inc.*

For more data circle No. 33 on postcard, p. 113

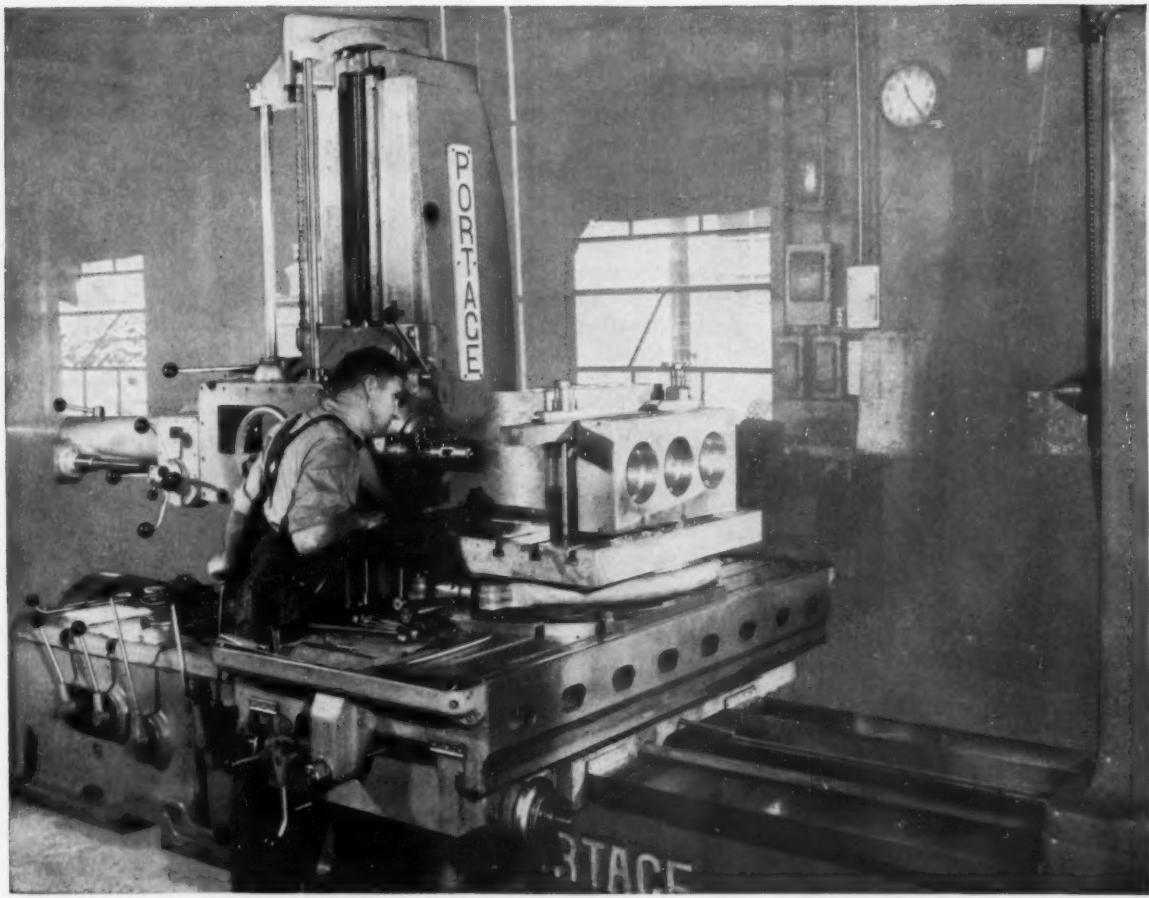


Photo courtesy 20TH Century Mfg. & Supply Co., Tulsa, Oklahoma

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The Portage Machine Co.
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Gentlemen:

Our business, as you know, is Contractors of Metal Products. This particular job is a steel forging being machined, and when finished will be a fluid cylinder for a high pressure pump used in the oil industry. These forgings are made from AISI-4140 steel and we are extremely proud of the job PORTAGE mills are doing.

We find our PORTAGE mills very accurate. These mills must repeat themselves in each location and operation often during the machining operation. Specifications call for very close tolerances and we have no trouble in doing this precision work.

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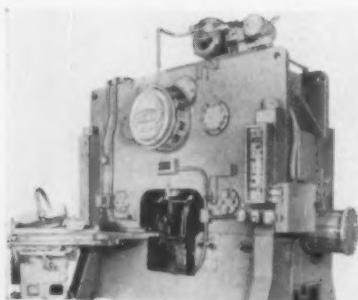


Coil suppliers move from machine to machine as needed

Improved coil cradles supply coil stock to presses and other equipment. They are equipped with casters, enabling easy movement from machine to machine, as needed. They are available in capacities from 1200 to 16,000-lb. The units handle coils up to 48-in. wide by 60-in. in diameter. Front wheels of the portable model swivel for steering. As the tongue is lowered,

the bed is lifted by a cam, clearing the floor $\frac{1}{4}$ -in. With the tongue in a vertical position, the bed front is lowered to set solidly on the floor. It can be equipped with a pinch roll unit. Casters can be supplied on the cradle alone or on a straightener combination, according to the manufacturer. *Benchmaster Mfg. Co.*

For more data circle No. 34 on postcard, p. 113



Dual slide extrusion units cut raw materials consumption

Considerable savings resulted from installation of two 100-ton mechanical presses at one manufacturing plant. These dual slide extrusion machines exert horizontal pressures required to extrude piston pins approximately $3\frac{1}{4}$ -in. long. Each press is completely automatic. The net productive capacity of each is approximately 2500 pieces hourly.

An attached hopper supplies short lengths of bar stock to the feeding mechanism for extruding to size, including inside diameter and length. Previously the process of machining these parts involved approximately 43 pct more raw material. *Danly Machine Specialties, Inc.*

For more data circle No. 35 on postcard, p. 113

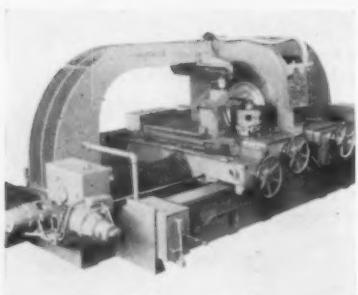


Safety device prevents "repeating" on presses

"Repeating," a dangerous condition resulting from air, electrical, or mechanical press failure, doesn't occur on presses having a new safety device. The hazardous situation happens when the slide continues to stroke even though the run buttons have not been depressed. Safety controls for eliminating this can be used in addition to normal press operating controls or may be installed on new presses.

The key device in the safety circuit is a limit switch. This is activated if the press crankshaft accidentally goes beyond its normal stopping point. The switch is usually set so that 5 to 10° of crankshaft overtravel will actuate the switch and stop the press. A red warning light system supplements the controls. It lights when trouble exists. *Clearing Machine Corp.*

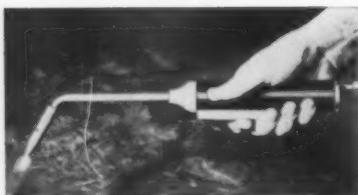
For more data circle No. 36 on postcard, p. 113



Designed for profile facing, a new center drive works disks of sizes ranging to 44-in. OD. Cutting tools mounted directly on opposite sides of the workpiece simultaneously turn both sides. Rough, semi-finishing and finishing passes are made on parts having a 22-in. diam and a thickness of 0.0029-in. Parallelism is within 0.001-in. The lathe com-

pletely eliminates undesirable "dishpan" effects sometimes prevalent in thin sections machined by conventional methods. Six sizes of the machine are available with longitudinal travel either way from center line varying from 24-in. or 12-in. to 36-in. or 18-in., depending on the model. *The Wickes Corp.*

For more data circle No. 37 on postcard, p. 113



Acetylene torch lights, shuts-off automatically

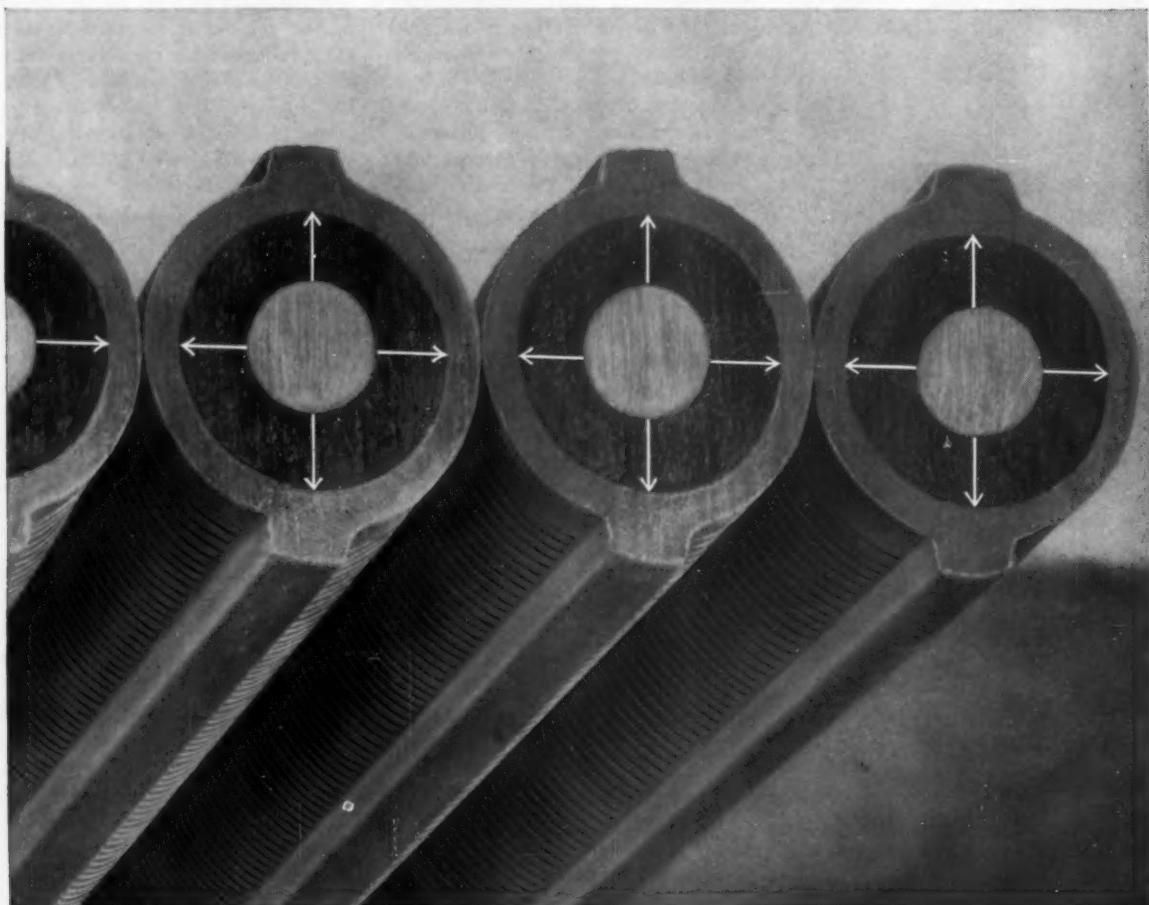
This acetylene torch lights automatically when the operator presses the control lever. It also shuts-off instantly when not in use. A battery-powered ignition lights the torch. There is no lock-on position

for the control lever. This insures automatic shut-off when not in use. Pressing the lever simultaneously opens the gas valve and ignites the gas. *Velocity Power Tool Co.*

For more data circle No. 38 on postcard, p. 113

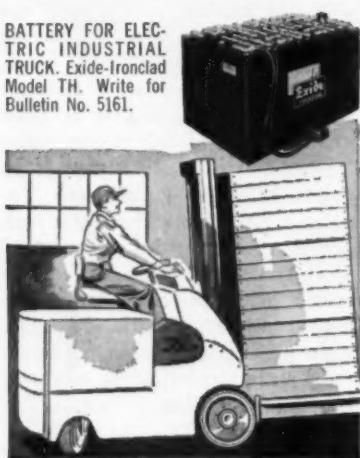
EXIDE-IRONCLAD BATTERIES

For electric industrial truck operation



Power tubes expand without shedding — preserve battery life

BATTERY FOR ELECTRIC INDUSTRIAL TRUCK. Exide-Ironclad Model TH. Write for Bulletin No. 5161.



Every time you discharge a storage battery, the active material on the positive plates expands. But the plate grids don't expand. This is basic.

On most batteries, the expanding active material tends to shear off from the nonexpanding grid every time the action takes place. But this can't happen in the Exide-Ironclad Battery. The reason is simple.

Active material is formed concentrically around the spinelike grid and held inside the plastic tubes. Expansion is predominantly in an outward direction—hence no shearing. Active material remains firmly locked to the underlying grid structure. And the flexible plastic tubes yield and take up as needed.

This extra protection against shedding of active material is only one of the many reasons for the long life of Exide-Ironclad Batteries. When you order heavy duty batteries, or the equipment requiring them, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®



This small, inexpensive complete cleaning machine is designed specifically for cleaning small precision parts. It offers washing, rinsing, and hot air drying in a single unit. Equipped with two removable transducer cans, it is also furnished with baskets, basket holders, and an ultrasonic beam disperser. It consists of a single cabinet into which is built an electronics unit capable of delivering about 35-w

Ultrasonic unit cleans precision parts

of R-F power at one megacycle. The circuit is provided with R-F shielding and filtering to eliminate radio interference. A step in the front of the cabinet is recessed to hold the two removable transducer cans. The top of the cabinet has an opening through which hot air from the electronic circuit is blown to provide a hot air drying facility. *McKenna Laboratories.*

For more data circle No. 39 on postcard, p. 113



Construction and materials handling jobs can be performed with a new truck-mounted crane. It will lift 15 tons at a 10-ft radius with a 30-ft boom. The crane is mounted on a specially engineered crane carrier. Basic design of the superstructure follows gas or dielectric principles. A new feature has been added to accommodate steel erection and construction possibilities. Two-line hoisting is avail-

Truck-mounted crane lifts 15-tons

able and each line can be operated independently from a separate drum. Both drums may be operated simultaneously and are equipped for power or gravity operation. It is available with boom lengths up to 75 ft. *Coles Cranes.*

For more data circle No. 40 on postcard, p. 113

Hardness gage

Small and accurate, a new hardness gage is about the size of a fountain pen. It indicates hardness in durometer units that comply with ASTM specifications for rubber hardness. The gage has a hardened steel indentor, made to close tolerances. Total range is 0.100-in. There are 100 divisions on the scale permitting readings of 0.001-in. *W. F. Orth.*

For more data circle No. 41 on postcard, p. 113

Dependable is the word for

Ruthman Gusher Coolant Pumps

Designed simply, with fewer moving parts to wear, Gusher Pumps are the last word in dependability. Pre-lubricated heavy-duty ball bearings require no further attention. There is no priming or packing necessary. Your Gusher pumps give you instant coolant flow from the moment the machine is started. Specify Ruthman Gusher Coolant Pumps.



Illustrated is a Model VH-6 WP Hammond Abrasive Belt Grinder equipped with a Ruthman Gusher Coolant Pump.



THE RUTHMAN MACHINERY CO.

1809-1823 READING RD., CINCINNATI 2, OHIO

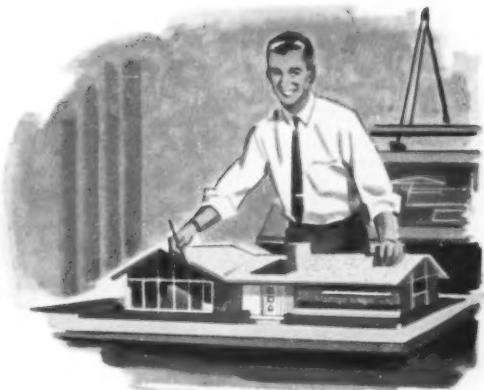
Epoxy-base paint

A new paint completely withstands the effects of acids, alkalies, alcohol, grease, oil, mildew and resists abrasion. It has an epoxy base and forms a tough, firmly adherent gloss coating on all metals, wood, wallboard, plaster and masonry surfaces. It is available in black and white plus all other colors that are consistent with a high degree of chemical resistance. The paint is not affected by acetic acid, carbon tetrachloride, concentrated muriatic, concentrated lye, concentrated ammonia, concentrated peroxide, diluted sulfuric, kerosene, glycerine, saturated oxalic, chlorox (sodium hypochlorite) or saturated trisodium phosphate (hot). *The Sealube Co.*

For more data circle No. 42 on postcard, p. 113

**in the home
everybody
benefits from**

STAINLESS STEEL



THE ARCHITECT designs Stainless Steel into windows, kitchens, work surfaces, ovens and other important places because he knows there is nothing like Stainless for clean, lasting beauty.

THE BUILDER has had long experience with Stainless Steel. It's easy to install, does not chip or peel, and its beautiful finish presents no problem on matching or replacement.



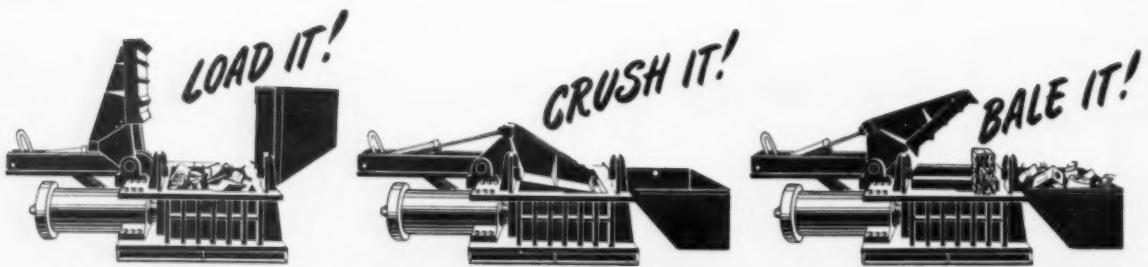
the owner likes living with Stainless Steel. It's always gleaming and beautiful, cleans with a wipe, and lasts forever. And, to complement her kitchen she loves to own those shiny pots, pans, tableware, and appliances, all made of Stainless Steel.

McLOUTH STAINLESS STEEL



FOR THE PRODUCT YOU MAKE TODAY AND THE PRODUCT YOU PLAN FOR
TOMORROW SPECIFY MCLOUTH HIGH QUALITY SHEET AND STRIP STAINLESS STEEL

McLOUTH STEEL CORPORATION DETROIT, MICHIGAN • MANUFACTURERS OF STAINLESS AND CARBON STEELS



We Build the Dempster-Balester to Load It, Crush It, Bale It—Bale After Bale After Bale

You not only get the nearest thing available to automatic baling when you buy a Dempster-Balester, but you get a press built to take the punishment of scrap metal baling consistently day-in and day-out . . . bale-after-bale-after-bale! The first Dempster-Balester was built in 1940 and it is still in operation. Today, hundreds of Dempster-Balesters are making money for men like yourself in over 200 cities in almost every state of the union, plus 15 foreign countries.

The Dempster-Balester's LOAD IT, CRUSH IT, BAILE IT cycle (illustrated above) is a simple 1-2-3 continuous operation. 1—Skip Pan Loader LOADS charging box. 2—Skip Pan returns to loading position

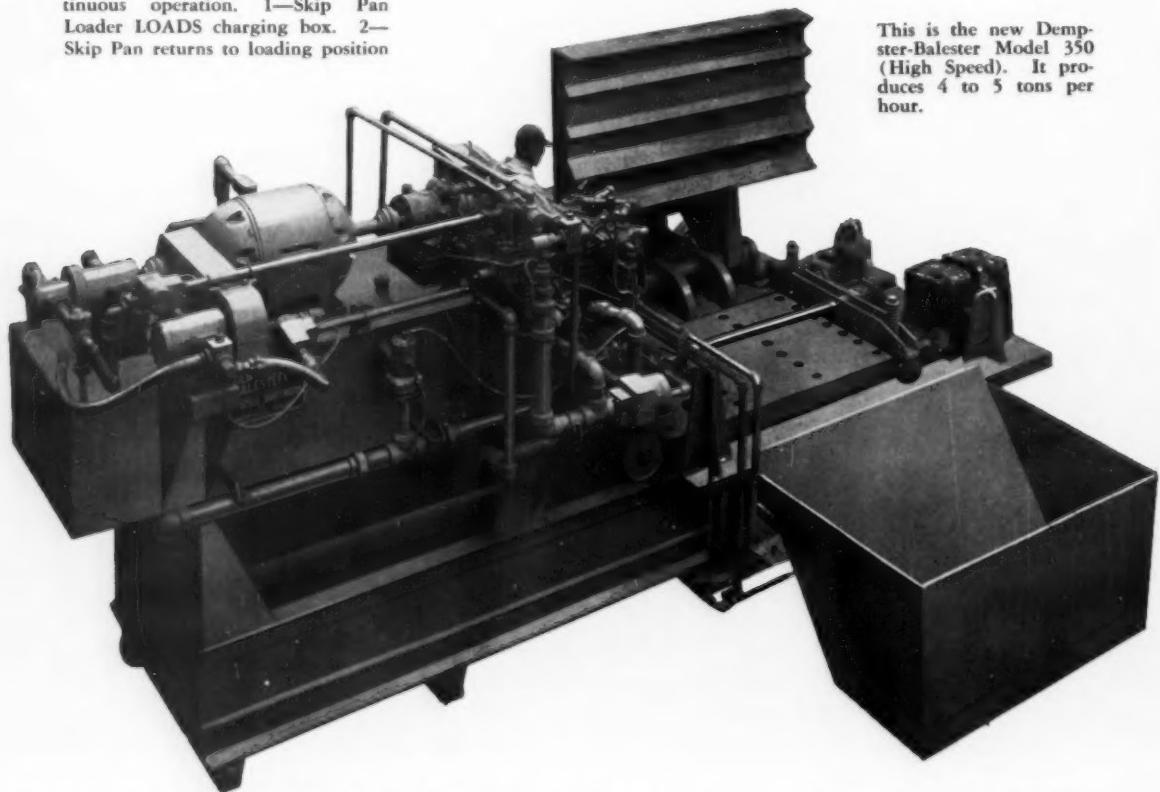
and Auxiliary Compression Door CRUSHES scrap with a 45-ton force. 3—As Compression Door returns to up-right position, charging box door closes . . . scrap is BALED and ejected. As each cycle ends another begins.

Without question, Dempster-Balesters are the fastest, most efficient presses baling scrap metal today! And you have six to choose from—three standard and three high speed models that turn out high density bales in capacities to meet any requirement from 1 to 9 tons per hour.

And don't overlook this important point. Before buying a baling press, it's important to know what kind of service you can expect. Certainly, no piece of heavy machinery can operate consistently without maintenance. Breakdowns cost money and when a part is needed for one of our presses, it is usually shipped the day your order is received. An ample stock of repair parts is constantly maintained to take care of you promptly! Write to us today for complete information.

A product of Dempster Brothers, Inc.

This is the new Dempster-Balester Model 350 (High Speed). It produces 4 to 5 tons per hour.



DEMPSTER BROTHERS, 4116 N. Knox, Knoxville 17, Tennessee

When steel is
3 times stronger
than iron . . .

Has two and
one-half times
the rigidity . . .

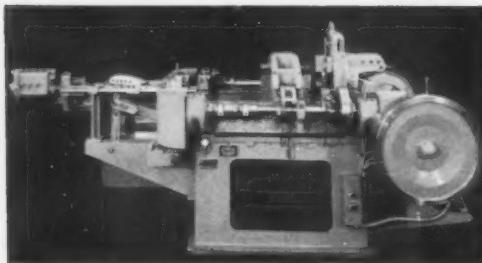
Yet costs
a third as much
per pound . . .

WHY
aren't more of
your products
designed for
welded steel?

*Photos courtesy
U. S. Tool Company, Inc.,
Ampere, New Jersey.*



Present welded steel design.



Present welded steel design.

**Cuts high replacement costs...
after switching to welded bases**

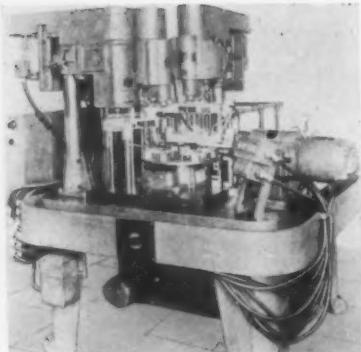
AFTER casting failures resulted in expensive replacement costs, this machine tool manufacturer converted his base designs to welded steel. Bases are now practically breakproof. Greater uniformity in dimensions saves time in locating parts in jigs. Appearance is greatly improved.

Lincoln can show you how to convert your designs to welded steel for similar savings and benefits. Write us today.

THE LINCOLN ELECTRIC COMPANY

Dept. 1525, Cleveland 17, Ohio

*Creating lower costs for industry
...with welded steel*

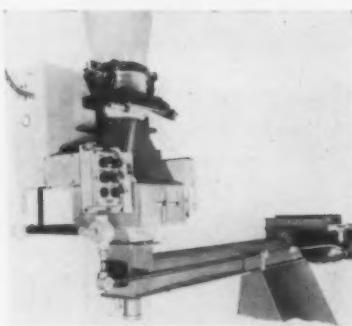


Machine drills, taps, reams and deburrs all at once

Every nine seconds, all at one time, ten holes are drilled, four deburred and two are tapped in an aluminum alloy diecasting on this machine. The eight-station, four-way drilling and tapping machine turns out 400 pieces an hour. Its multiple drilling and tapping setup consists of two standard vertical drill units, one vertical automatic lead screw tapping unit, and one horizontal drill unit. These assemblies are

mounted on a standard cast iron machine base with a built-in coolant tank and pump. Electrical controls and wiring conform to JIC standards. Tooling consists of an eight-station index table with eight nests to receive the part. Machines such as this, with more or less elaboration, can be adapted for any small hole operations. *Ettco Tool & Machine Co., Inc.*

For more data circle No. 43 on postcard, p. 113



Pushbutton scale weighs adhesive materials

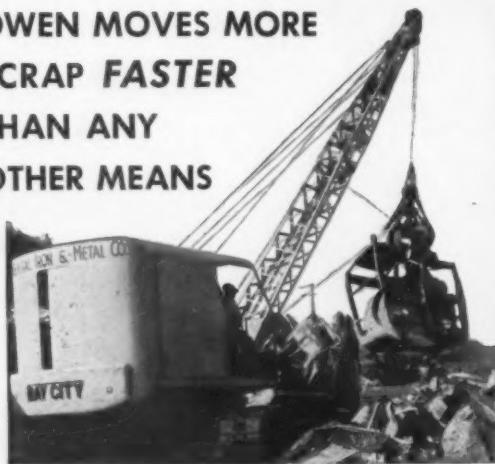
Automatic, distortion-free weighing of difficult adhesive materials is provided by a newly designed gross weigher. Automatic features of the scale include pushbutton control, automatic feed and bin level switches, and a choice of power feed mechanisms. The scale feeds directly into a bag suspended from the weigh beam, rather than through a weigh hopper. This keeps material continuously in motion

until it falls into the bag, eliminating material buildup and erratic discharge. Besides handling adhesives, it will accommodate non-adhesive feeds, products and chemicals. It handles 25 to 100-lb bags at normal operating speeds of five or six bags a minute. Accuracy is reported at an average of one to two ounces. *Richardson Scale Co.*

For more data circle No. 44 on postcard, p. 113

ON EACH PASS... Get a BIGGER BITE with **OWEN Scrap GRAPPLERS**

**OWEN MOVES MORE
SCRAP FASTER
THAN ANY
OTHER MEANS**



Write for Illustrated Brochure

The OWEN BUCKET CO. • BREAKWATER AVE. • CLEVELAND 2, OHIO

Branches: New York, Philadelphia, Chicago, Berkeley, Calif., Ft. Lauderdale, Fla.

Manufacturers of OWEN CLAMSHELL BUCKETS

MUNDT PERFORATED METALS

The few perforations illustrated are indicative of the wide variety of our line—we can perforate almost any size perforation in any kind of metal or material required. Send us your specifications.

Sixty-seven years of manufacturing perforated metals for every conceivable purpose assure satisfaction.

Write for New Catalog of Patterns



TIN, STEEL, COPPER, ALUMINUM, BRONZE
BRASS, ZINC, ANY METAL, ANY PURPOSE

CHARLES MUNDT & SONS
50 FAIRMOUNT AVE. JERSEY CITY, N. J.



**Call your AIM*...as Alcan did...
Steel strapping aluminum ingots aids customers**

Acme Idea Man,
Art Rochette,
worked with
Alcan technical men
on this
problem.



ALUMINUM COMPANY OF CANADA, LTD., Montreal, P. Q., modified its method of bundling ingots and improved freight car bracing techniques for added customer service. The new procedures insure delivery of intact, easily-handled bundles of ingots at Alcan's customers' plants. This lading protection advance is an example of how Alcan technical men and the Acme Idea organization cooperated to determine and prove a better packing and shipping method. (Idea No. S3-1.)

As a result of the Acme Idea method, 41 aluminum ingots are securely nested and bundled with Acme Steel Strapping. Using new freight car bracing techniques that help prevent disruption, the bundled ingots arrive at destination intact and are easily handled by lift truck. Car loading is faster and easier while unloading and storing by Alcan's customers is speeded up, more economical.

***Call your Acme Idea Man.** He will be glad to show you his file of time and money saving ideas. Write: Dept. IFS-116, Acme Steel Products Division, Acme Steel Company, 2840 Archer Ave., Chicago 8, Ill., In Canada, Acme Steel Company of Canada, Ltd., 743 Warden Avenue, Toronto 13, Ont.

**ACME
STEEL**

STEEL STRAPPING

BUYERS GUIDE TO STAINLESS

A Directory of Ryerson Stainless Steels and Services

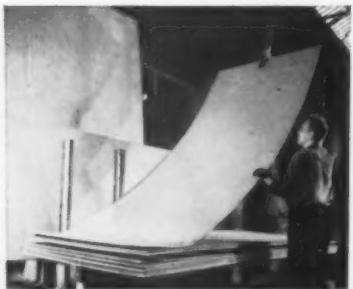
Here's a quick guide to the nation's largest stocks of stainless steel—2,351 sizes, shapes, types and finishes of Allegheny stainless in stock at Ryerson.

This wide selection assures you of getting the best stainless for every application. Extra care in storage, handling and shipping—such as padded shear clamps to protect finish and flatness of sheets—guards the high quality of Ryerson stainless stocks. And in addition, the help of full-time stainless specialists is yours when you call Ryerson.

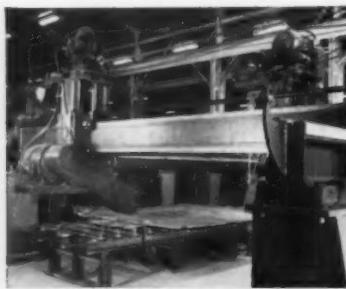
See your Ryerson catalog for a complete listing of stocks and call your nearby Ryerson plant for quick shipment of Allegheny stainless—one piece or a truckload.



Sheets—11 analyses of Allegheny stainless sheets in stock including nickel-bearing and straight chrome types. Also extra wide sheets to reduce welding costs.



Plates—Available in 9 analyses including plates to AEC requirements and to ASTM specifications for code work. Also extra low carbon types for welding.



True-Square Disc Cutting—Stainless plates up to 12' x 25' cut absolutely square on abrasive disc machine. Length & width tolerance + or - 1/32".



New Type 202 Allegheny Stainless, available in 14 to 26 gauge sheets, compares favorably with 302 in corrosion resistance; costs 2 1/4¢ per lb. less.



Bars and Angles—Rounds, squares, flats, hex's and angles in 8 types including free-machining with both chemistry and properties controlled for best performance.



Circles, Rings, Irregular Shapes—Practically any shape, no matter how intricate, can be accurately flame cut at Ryerson from stainless plate.



Pipe and Tubing—Light wall, standard and extra heavy pipe, ornamental and regular stainless tubing. Also flanged, screwed, welding and Quikup fittings.



Aircraft Stainless—Sheets, strip, plate and bars to Government and Aeronautical Specifications. Write for Ryerson Aircraft Steels booklet.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • WALLINGFORD, CONN.
PHILADELPHIA • CLEVELAND • CHARLOTTE • CINCINNATI • DETROIT • PITTSBURGH • BUFFALO
CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

The Iron Age SUMMARY . . .

Production pace strains mill equipment . . . But incoming orders still exceed output at some mills . . . Sales people looking for capacity operations through first half.

Hard on Equipment . . . Steel demand is straining mill production facilities to the limit. The situation has reached the point where even minor breakdowns are critical. For despite breakneck production, incoming orders are exceeding output at most mills.

Steel sales people are beginning to see the handwriting on the wall. Some of them are predicting capacity operations through the first half of 1957, and perhaps beyond. A serious breakdown in international relations could make matters worse.

The apparent calm of the present market is misleading. Beneath the surface, a quiet jockeying for position on mill order books is going on among steel buyers. And for some it's a matter of making good or cutting back operations.

Plate and structural users are about ready to toss in the sponge. Rolling mills for these products are running at capacity. Despite this, hardship cases continue to pile up.

Automotive Gamble . . . The automotive market is strong and will get stronger. Some Detroit purchasing agents are under pressure to hold down year-end inventories for tax reasons. And

it's a gamble that may or may not pay off. Trying to make up this tonnage in January could create a serious crisis for the automakers.

If the longshoremen's strike continues, it could relieve some of the pressure on steel scrap prices, which are now at record-breaking levels. Scrap scheduled for export would be diverted to domestic consumers, and prices would tend to level out.

But this wouldn't bring much cheer to the mills. A long shipping tieup would strike another blow at their iron ore supplies, already suffering as a result of last summer's strikes in the ore fields and on Great Lakes carriers. Losses would be felt next spring, when ore stocks are at low ebb before Lake shipping opens.

Defense Jitters . . . Meanwhile, the Defense Dept. is getting jittery over effect of the Suez crisis on demand for plate and oil country goods. It is taking another look at proposals to reopen expansion goals for plate and pipe. This would permit mills to take fast-tax write-offs for new facilities expanding capacity of these critical products. The question may be up for decision in a few weeks.

Steel Output, Operating Rates

Production (Net tons, 000 omitted)	This Week	Last Week	Month Ago	Year Ago
2,462	2,474	2,511	2,297	
Ingot Index (1947-1949=100)				
153.3	154.0	156.3	148.5	
Operating Rates				
Chicago	99.0	109.5	103.0	98.5
Pittsburgh	97.0	97.0	101.0	103.0
Philadelphia	105.0	103.0	106.5	103.0
Valley	99.0	99.0	99.0	100.0
West	102.0	100.0	104.0	101.0
Detroit	104.0	106.0*	105.0	95.0
Buffalo	105.0	105.0	105.0	105.0
Cleveland	104.0	102.5*	107.5	97.5
Birmingham	96.0	96.0	96.0	94.0
S. Ohio River	96.0	99.0*	83.0	90.0
Upper Ohio R.	105.0	103.0*	107.0	105.0
St. Louis	100.0	107.0	94.5	109.0
Northeast	100.0	100.0	100.0	97.0
Aggregate	100.0	100.5	102.0	99.0

*Revised

Prices At A Glance

	(cents per lb unless otherwise noted)			
	This Week	Week Ago	Month Ago	Year Ago
Composite price				
Finished Steel, base	5.622	5.622	5.622	5.174
Pig Iron (Gross Ton)	\$63.04	\$63.04	\$63.04	\$59.09
Scrap, No. 1 hvy (gross ton)	\$61.33	\$61.17	\$56.83	\$45.83
Nonferrous				
Aluminum ingot	27.10	27.10	27.10	24.40
Copper, electrolytic	40.00	40.00	40.00	43.00
Lead, St. Louis	15.80	15.80	15.80	15.30
Magnesium ingot	36.00	36.00	36.00	33.25
Nickel, electrolytic	64.50	64.50	64.50	64.50
Tin, Straits, N. Y.	112.75	107.00	107.25	98.875
Zinc, E. St. Louis	13.50	13.50	13.50	13.00

*Revised

Tax Write Offs for Plate, Tube?

It's "pretty certain" opposition to fast tax-am on these two categories, at least, will fade, ODM says . . . Oil, tanker programs the cause . . . Nickel substitution urged.

◆ SUEZ CRISIS and the resulting pressure for stepped up oil and tanker production are increasing chances that tax write offs may be granted, at least for heavy steel plate and oil country tubular goods.

Officials of the Office of Defense Mobilization now say it is "pretty certain" that opposition to steel write offs in these two categories will fade. Factors cited are need for steel to build new tankers, stimulation of the search for crude oil, and demand for increased petroleum production facilities.

ODM has asked Defense to step up its computations of anticipated requirements for next year and submit them by the end of December rather than in mid-January. Mobilization officials want to get the question settled quickly—one way or the other—so steel industry expansion plans can go ahead.

In addition, demand for shipbuilding steel has government officials studying need for new allocation systems to make sure plate gets to the shipyards. However, odds are that allocation will not be adopted this side of a more serious international outbreak.

Government is rumored considering a "voluntary allocation system," but belief is that it would only complicate the problem.

With defense budgets going upward, ODM officials expect the Defense Department's steel requirements to show an increased expansion goal for steel plate and tubular goods. Supplies for tanker construction, as defense supporting requirements, would be at the top of these needs. This leads ODM officials to believe they can "make a case" for renewed tax amortization.

Defense Secretary Wilson has strongly emphasized need for industry to save nickel voluntarily in its manufacturing processes. Plea for greater use of substitute materials, especially manganese-bearing stainless steels, was made by the Secretary in a Defense Dept. conservation bulletin.

Pointing out that national nickel consumption could be cut ten pct by substituting manganese steels, he stated that conservation would enable the country to get more effective results from limited supplies without the necessity of controls.

The Armed Forces, Mr. Wilson said, have told designers to try other non-nickel stainless steels, aluminum, or plastics, to replace nickel-bearing stainless. He urges industry-wide efforts to get maximum benefits from the substitutes.

SHEET AND STRIP . . . Cold-rolled market in Detroit reported "comfortable" for January. Hot-rolled, however, is still a tight item.

One mill in Cleveland is booked solid on sheet through January with some orders being taken into March. Others have open time for January and a few spot shortages for December caused by auto deferments.

At Pittsburgh automotive produc-

ers went right down to the Nov. 15 deadline before placing January orders for cold-rolled sheet. When they did come in, the automotive buyers picked up full quotas from one area mill at least.

What product tonnage is being turned down by the automotive purchasers in Detroit area is automatically going back to the parent mill. Regional sales offices are not even getting the chance to sell it.

Strip is sold solid through this quarter and one to two months beyond at Chicago, even without automotive market push. There's a possible two week carryover for hot-rolled sheet with conversion of heavier gages already booked for first quarter.

BAR . . . In Pittsburgh demand for hot-rolled carbon bars continues to exceed supply for most sizes. Indications are mills will be booked to capacity in the first quarter of 1957.

Market for hot-rolled and special quality forging bars is easing somewhat at Detroit. Cold-finished bars are plentiful.

Fourth quarter is sold out at Chicago in hot-rolled with a carryover for the first quarter of '57. Full bookings are expected through the first three months. Cold-finished bars continue gradual pickup with delivery time now at a maximum of eight weeks. Outlook for cold finished bar in all grades is tightening through December and at least the opening months of the first quarter.

PIPE QUANTITY EXTRAS . . . Change in these extras may have effect of increasing amount of buying done through distributors. Under the old system a flat 6 pct extra was charged on items in a mixed carload. The new system applies a point scale which varies according to quantity and pipe size. It will increase the cost of carloads containing many different sizes in small quantities. Those adopting new methods include National Tube Div. of U. S. Steel, National Supply Corp., Jones & Laughlin, and Youngstown Sheet and Tube.

PRICE CHANGES . . . Jones & Laughlin Steel Corp. has increased size and section extras on junior beams by 25c per hundred lb. Change was effective Nov. 9. Superior Steel Corp. has revised base prices on copper clad strip downward effective Nov. 7. (New prices are on p. 145 of this issue).

Purchasing Agent's Checklist

MARKETING: Jets dominate aircraft engine market p. 60

DETROIT: Auto parts makers vie for new markets p. 68

WEST COAST: Metalworking will share construction boom p. 75

TECHNICAL: Get better wear resistance with ceramics p. 91

Comparison of Prices

(Effective Nov. 20, 1956)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price advances over previous week are printed in Heavy Type; declines appear in Italics.

Nov. 20 Nov. 13 Oct. 23 Nov. 23
1956 1956 1956 1956

Flat-Rolled Steel: (per pound)

Hot-rolled sheets	4.675¢	4.675¢	4.675¢	4.325¢
Cold-rolled sheets	5.75	5.75	5.75	5.825
Galvanized sheets (10 ga.) ..	6.30	6.30	6.30	5.85
Hot-rolled strip	4.675	4.675	4.675	4.325
Cold-rolled strip	6.870	6.870	6.870	6.29
Plate	4.87	4.87	4.87	4.52
Plates, wrought iron	10.40	10.40	10.40	9.30
Stain's C-R strip (No. 302) ..	47.50	47.50	47.50	44.50

Tin and Terneplate: (per base box)

Tinplate (1.50 lb.) cokes	\$0.95	\$0.95	\$0.85	\$0.05
Tinplates, electro (0.50 lb.) ..	8.65	8.65	8.55	7.75
Special coated mfg. terne	9.20	9.20	9.10	7.85

Bars and Shapes: (per pound)

Merchant bars	5.075¢	5.075¢	5.075¢	4.65¢
Cold finished bars	6.85	6.85	6.85	5.90
Alloy bars	6.125	6.125	6.125	5.65
Structural shapes	5.00	5.00	5.00	4.60
Stainless bars (No. 302)	40.75	40.75	40.75	38.25
Wrought iron bars	11.50	11.50	11.50	10.40

Wire: (per pound)

Bright wire	7.20¢	7.20¢	7.20¢	6.25¢
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Rails: (per 100 lb.)

Heavy rails	\$5.075	\$5.075	\$5.075	\$4.725
Light rails	6.00	6.00	6.00	5.65

Semi-finish Steel: (per net ton)

Rerolling billets	\$74.00	\$74.00	\$74.00	\$68.50
Slabs, rerolling	74.00	74.00	68.50	
Forging billets	91.50	91.50	84.50	
Alloy blooms, billets, slabs	107.00	107.00	107.00	96.00

Wire Rod and Skelp: (per pound)

Wire rods	5.80¢	5.80¢	5.80¢	5.025¢
Skelp	4.225	4.225	4.225	4.225

Finished Steel Composite: (per pound)

Base price	5.622¢	5.622¢	5.622¢	5.174¢
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Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

STAINLESS STEEL

←To identify producers, see Key on P. 144→

Nov. 20 Nov. 13 Oct. 23 Nov. 23
1956 1956 1956 1956

Pig Iron: (per gross ton)				
Foundry, del'd Phila.	\$67.76	\$67.76	\$67.76	\$63.69
Foundry, Valley	63.00	63.00	63.00	59.00
Foundry, Southern Cin'ti	67.17	67.17	67.17	62.93
Foundry, Birmingham	59.00	59.00	59.00	55.00
Foundry, Chicago	63.00	63.00	63.00	59.00
Basic del'd Philadelphia	66.84	66.84	66.84	62.77
Basic Valley furnace	62.50	62.50	62.50	58.50
Malleable, Chicago	63.00	63.00	63.00	59.00
Malleable, Valley	63.00	63.00	63.00	59.00
Ferromanganese, cents per lb.	11.75¢	11.75¢	11.75¢	9.50¢
74 to 76 pct Mn base.				

Pig Iron Composite: (per gross ton)				
Pig iron	\$63.04	\$63.04	\$63.04	\$59.09

Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	\$62.50	\$62.50	\$57.50	\$45.50
No. 1 steel, Phila. area	58.50	58.50	56.50	47.50
No. 1 steel, Chicago	63.00	62.50	62.50	44.50
No. 1 bundles, Detroit	60.50	60.50	62.50	40.00
Low phosph., Youngstown	68.50	68.50	64.50	49.50
No. 1 mach'y cast, Pittsburgh	61.50	61.50	59.50	52.50
No. 1 mach'y cast, Philadel'a.	58.00	58.00	58.00	52.50
No. 1 mach'y cast, Chicago	58.50	58.50	56.50	54.50

Steel Scrap Composite: (per gross ton)				
No. 1 heavy melting scrap	\$61.33	\$61.17	\$56.88	\$45.83

Coke, Connellsville: (per ton not at oven)				
Furnace coke, prompt	\$15.50	\$15.50	\$14.50	\$14.25
Foundry coke, prompt	\$18-19	\$18-19	\$17-18	\$16.25

Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	40.00	40.00	40.00	43.00
Copper, Lake, Conn.	40.00	40.00	40.00	43.00
Tin, Straits, New York	112.75¢	107.00	107.25	98.875
Zinc, East St. Louis	13.50	13.50	13.50	13.00
Lead, St. Louis	15.80	15.80	15.80	15.30
Aluminum, virgin ingot	27.10	27.10	27.10	24.40
Nickel, electrolytic	64.50	64.50	64.50	64.50
Magnesium, ingot	36.00	36.00	36.00	33.25
Antimony, Laredo, Tex.	33.00	33.00	33.00	33.00

† Tentative. ^a Average. ^b Revised.

Steel Scrap Composite

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

Base price cents per lb. f.o.b. mill.

Product	201	202	301	302	303	304	316	321	347	403	410	416	438
Ingots, reroll.	19.75	21.00	20.50	22.00	—	23.25	35.25	28.25	32.75	—	16.00	27.75	16.25
Slabs, billets	24.50	27.25	25.25	28.00	28.50	29.25	44.50	35.75	42.00	—	29.75	—	21.00
Billets, forging	—	33.00	33.75	34.00	37.00	36.00	56.25	42.25	50.25	30.75	27.25	27.75	27.75
Bars, struct.	39.00	39.25	40.50	40.75	43.75	43.00	66.75	50.25	59.00	36.25	32.50	33.00	33.00
Plates	—	41.25	42.50	43.00	45.50	45.75	70.25	54.50	63.75	38.75	33.75	35.50	34.50
Sheets	45.00	45.25	47.25	47.50	55.75	50.25	74.75	60.00	73.00	46.50	38.75	46.50	39.25
Strip, hot-rolled	33.00	35.75	34.00	36.75	—	39.75	63.50	48.75	58.25	—	29.75	—	30.75
Strip, cold-rolled	41.50	45.25	43.75	47.50	52.00	50.25	74.75	60.00	73.00	46.50	38.75	46.50	39.25
Wire CF; Rod HR	—	37.25	38.35	38.75	41.50	40.75	63.50	48.00	56.25	34.50	31.00	31.50	31.50

STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., C11; Brackenridge, Pa., A3; Butler, Pa., A7; Vandergrift, Pa., UI; Washington, Pa., W2, J3; Baltimore, E1; Middletown, O., A7; Masillon, O., R3; Gary, UI; Bridgeville, Pa., U2; New Castle, Ind., I2; Ft. Wayne, J4; Philadelphia, D5.

Strip: Midland, Pa.; Waukegan, Cleveland, A5; Carnegie, Pa., S9; McKeesport, Pa., F1; Reading, Pa., C2; Washington, Pa., W2; Leechburg, Pa., U2; Dunkirk, N.Y., A3; Masillon, O., R3; Chicago, UI; Syracuse, N.Y., C11; Youngstown, C5; Sharon, Pa., S1; Butler, Pa., A7; Wallingford, Conn., U3 (plus further conversion extras); W1 (25 per lb. higher); New Bedford, Mass., R6; Gary, UI (25¢ per lb. higher).

Bar: Baltimore, A7; Duquesne, Pa., UI; Munhall, Pa., UI; Reading, Pa., C2; Titusville, Pa., U2; Washington, Pa., J2; McKeesport, Pa., UI, F1; Bridgeville, Pa., U2; Dunkirk, N.Y., A3; Masillon, O., R3; Chicago, UI; Syracuse, N.Y., C11; Watervliet, N.Y., A3; Syracuse, C11; Bridgeville, U2.

Structures: Baltimore, A7; Masillon, O., R3; Chicago, Ill., J4; Watervliet, N.Y., A3; Syracuse, C11; Chicago, UI.

Plates: Brackenridge, Pa., A3; Chicago, UI; Munhall, Pa., UI; Midland, Pa., C11; New Castle, Ind., I2; Middletown, A7; Washington, Pa., J2; Cleveland, Masillon, R3; Coatesville, Pa., C15; Philadelphia, D5; Vandergrift, Pa., UI; Gary, UI.

Forgings: Midland, Pa., C11; Baltimore, A7; Washington, Pa., J2; McKeesport, F1; Masillon, Canton, O., R3; Watervliet, A3; Pittsburgh, Chicago, UI; Syracuse, C11; Detroit, R5; Munhall, Pa., S. Chicago, UI.

Differentials: Add .50¢ per ton for each .025 pct silicon or portion thereof over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct); .50¢ per ton for each .050 pct phosphorus or portion thereof over 1 pct; \$2 per ton for each .05 to .075 pct nickel; \$1 for each additional .025 pct nickel.

* Add \$1.00 for 0.31-0.69 pct phos. † Intermediate low phos.

‡ Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 phos.).

§ Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 phos.).

** Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 phos.).

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** Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 phos.).

** Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 phos.).

** Add \$1.00 for 0.31-0.50 phos. plus .50¢ per ton for each .025 pct silicon or portion thereof over base (1.50-1.55 ph

Will Strike Break Market?

Tieup of ports fails to crack market . . . But extended tieup would bring prices down . . . Continued strong mill rate prevents real break in the market . . . Composite up.

♦ **EASTERN MARKETS** held firm through the first days of the International Longshoremen's strike which cut off East and Gulf Coast scrap exports.

The trade generally believed that prices would hold for a week to 10 days. If the strike did not end by that time, a significant drop in eastern markets was sure to follow.

However, prices were not expected to break sharply, even if the strike lasted for some time. Exports are a strong prop to the market and influence of an extended strike would probably reach far inland. But continued strong demand for scrap and high mill operating rate would prevent anything that could be called a break in the market.

Consumers could be expected to push the strike effect for all they can. Prices continue at a level where mills are reluctant to pay. And the strike might provide a wedge, at least in eastern markets, to try to beat prices down.

In the Midwest, attempts to break the price levels met with defeat. On the strength of firm markets in the East and Pittsburgh, and a slight rise in Chicago, THE IRON AGE Composite Price edged up another record-breaking notch to \$61.33.

Mills had favorable weather on their side, forestalling the usual seasonal slump in collections in most areas. Failure of mills to build up inventories and lack of scrap in dealer yards indicates a continued high market for some time.

Pittsburgh . . . The market is as strong as ever. Brokers are paying as much as \$5 over official mill prices to cover old orders to local mills. Dealers are quoted even higher for

shipment out of the district. Late railroad lists show specialties and No. 1 railroad heavy melting up \$1. Price of low phos has been confirmed by foundry buying. Factory bundles are very strong, with heavy tonnages moving at \$76.

Chicago . . . Offering prices at \$2 to \$3 below existing levels failed to weaken the market and brought virtually no tonnage. Scrap supplies in the area are extremely low. The rapid rise in market levels has caused high shipments and yard inventories are low and probably will stay that way. Most dealers could not cover lower priced orders, not only for fear of being caught short, but because they do not have the material.

Philadelphia . . . The longshoremen's strike has thrown a brake on this market. Big mills have taken a wait-and-see attitude. If the strike carries over into next week, a sharp decrease in prices is expected. But if it ends soon, the market remains strong. Steelmaking grades remained unchanged, but \$1 and \$2 increases were reported for low phos, cast and electric furnaces grades.

New York . . . Steelmaking and blast furnace prices continue unchanged here, but brokers and dealers are hoping for a quick end to the dock strike which has tied up all Atlantic ports. If this strike continues for a long period, scrap exports could suffer, and an important prop to this market would be badly weakened.

Detroit . . . The market continues to mark time, pending closing of December auto lists. No new sales have been reported, with dealers busy filling old orders. Following the closing of December lists, No. 1 factory bundles will be added to Detroit price quotations on the Scrap Prices page.

Cleveland . . . Shipments were held up at one local mill as some furnaces

went out of service for maintenance. They continued heavy to other local and Valley mills. Some slight additional strength is showing up in prime grades in the Valley. Some No. 2 bundles are being shipped to Pittsburgh and upper Ohio area. Foundry business has slowed to a walk with high price resistance. Dealers say collections are about the same, but favorable fall weather has postponed seasonal slowdown.

Birmingham . . . An Alabama steel mill, usually the largest buyer of openhearth scrap, but out of the market for about three months, made a limited purchase of No. 2 heavy melting at a price advance of \$3 per ton. Brokers automatically increased quotations for No. 1 grades to maintain the customary \$2 differential. Some electric furnaces also raised prices in line with the openhearth. No. 1 cast also advanced \$1 when a consumer who had been out of the market for months came into the market. The dock strike on Gulf and Atlantic coasts did not immediately affect export prices.

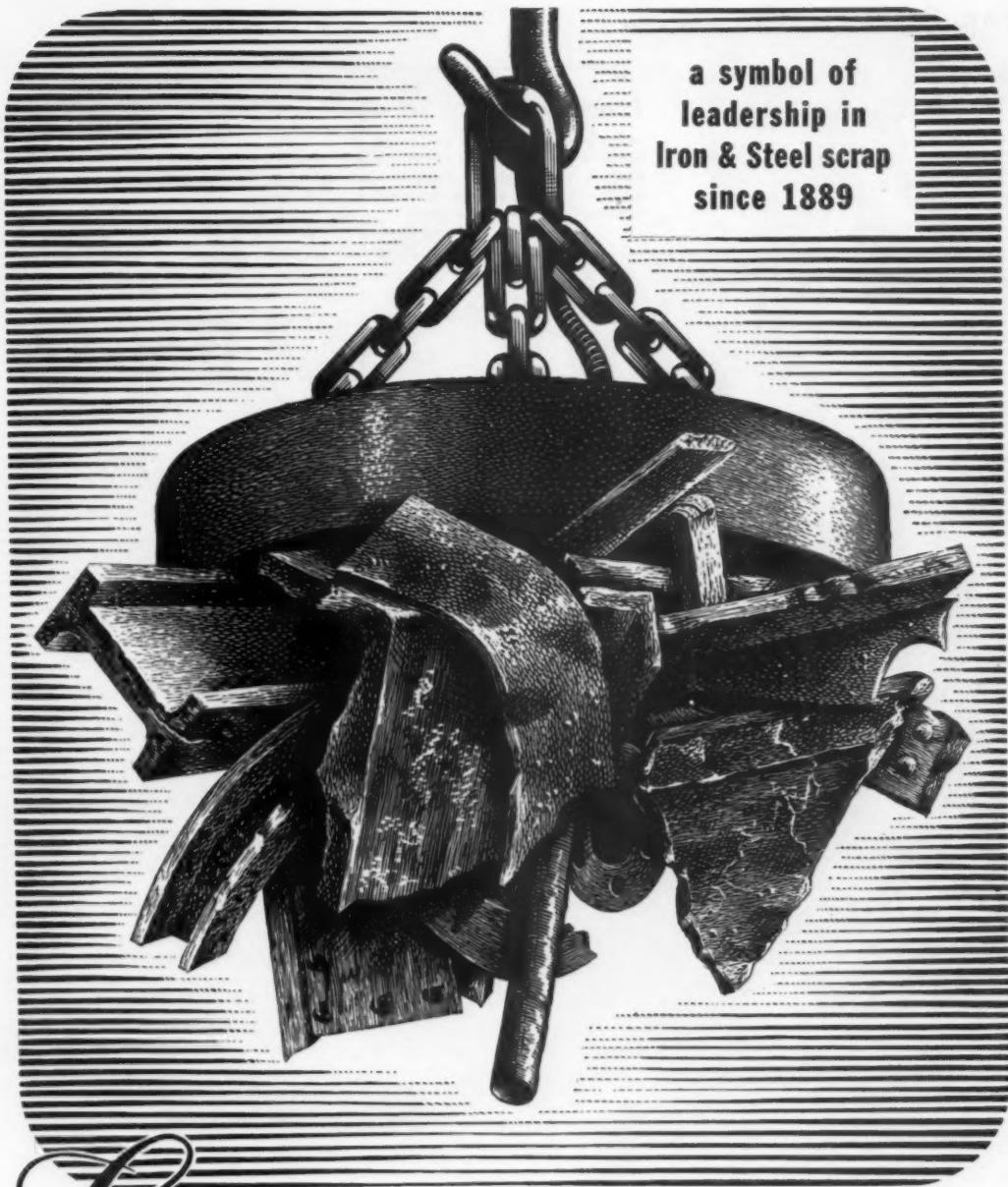
St. Louis . . . Mills have advanced their prices \$3 per ton on prime grades. This was needed to keep scrap home in the face of increased strength in other markets. Railroad items are also \$2 to \$4 higher. Some cast grades are up \$2. Movement to this district is slightly off.

Cincinnati . . . There is little new sales activity, but brokers are having some trouble covering their orders. Prices remain firm with some prospect for a slight additional increase.

Buffalo . . . The market continues strong although no new orders have been placed. There are still orders out at lower prices that have to be filled, but mills are having trouble bringing them in. Favorable weather may extend shipping season and this would assist mills in building inventories by water shipment.

Boston . . . Export was crippled by the Longshoreman's strike, but domestic demand more than took up the slack. Scattered sales of primary grades brought prices up \$1 while electric furnace demand raised prices of electric furnace grades a full \$2.

West Coast . . . All is quiet on the West Coast scrap front. Mills say they can get all the scrap they want at current prices. Threatened tieup of West Coast shipping threw a scare into export for a time. Cast and No. 2 bundles are down in Los Angeles.



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Scrap Prices (Effective Nov. 26, 1956)

Pittsburgh

No. 1 hvy. melting	\$62.00 to \$63.00
No. 2 hvy. melting	53.00 to 54.00
No. 1 bundles	62.00 to 63.00
No. 1 factory bundles	75.00 to 76.00
No. 2 bundles	49.00 to 50.00
Machine shop turn.	41.00 to 42.00
Mixed bor. and ms. turn.	41.00 to 42.00
Shoveling turnings	46.00 to 47.00
Cast iron borings	46.00 to 47.00
Low phos. punch'gs plate.	71.00 to 72.00
Heavy turnings	55.00 to 56.00
No. 1 RR. hvy. melting	70.00 to 71.00
Scrap rails, random lgth.	78.00 to 79.00
Rails 2 ft and under	82.00 to 83.00
RR. steel wheels	75.00 to 76.00
RR. spring steel	75.00 to 76.00
RR. couplers and knuckles	75.00 to 76.00
No. 1 machinery cast.	61.00 to 62.00
Cupola cast.	53.00 to 54.00
Heavy breakable cast.	51.00 to 52.00

Chicago

No. 1 hvy. melting	\$62.00 to \$64.00
No. 2 hvy. melting	53.00 to 54.00
No. 1 factory bundles	70.00 to 71.00
No. 1 dealers' bundles	63.00 to 64.00
No. 2 dealers' bundles	47.00 to 48.00
Machine shop turn.	41.00 to 42.00
Mixed bor. and turn.	43.00 to 44.00
Shoveling turnings	44.00 to 45.00
Cast iron borings	43.00 to 44.00
Low phos. forge crops.	74.00 to 75.00
Low phos. punch'gs plate.	71.00 to 72.00
Low phos. 2 ft and under	69.00 to 70.00
No. 1 RR. hvy. melting	69.00 to 70.00
Scrap rails, random lgth.	80.00 to 81.00
Rerolling rails	91.00 to 92.00
Rails 2 ft and under	88.00 to 89.00
Locomotive tires, cut	74.00 to 75.00
Cut bolsters & side frames	74.00 to 75.00
Angles and splice bars	79.00 to 80.00
RR. steel car axles	93.00 to 94.00
RR. couplers and knuckles	73.00 to 74.00
No. 1 machine cast.	58.00 to 59.00
Cupola cast.	53.00 to 54.00
Heavy breakable cast.	48.00 to 50.00
Cast iron brake shoe.	50.00 to 51.00
Cast iron wheels	58.00 to 60.00
Malleable	73.00 to 74.00
Stove plate	50.00 to 51.00
Steel car wheels	74.00 to 75.00

Philadelphia Area

No. 1 hvy. melting	\$58.00 to \$59.00
No. 2 hvy. melting	48.00 to 49.00
No. 1 bundles	58.00 to 59.00
No. 2 bundles	48.00 to 49.00
Machine shop turn.	41.00 to 42.00
Mixed bor. short turn.	40.00 to 41.00
Cast iron borings	49.00 to 41.00
Shoveling turnings	45.00 to 46.00
Clean cast chem. borings	48.00 to 49.00
Low phos. 5 ft and under	63.00 to 64.00
Low phos. 2 ft and under	65.00 to 66.00
Low phos. punch'gs	65.00 to 66.00
Elec. furnace bundles	61.00 to 62.00
Heavy turnings	55.00 to 56.00
RR. steel wheels	71.00 to 72.00
RR. spring steel	71.00 to 72.00
Rails 18 in. and under	80.00 to 82.00
Cupola cast.	52.00 to 54.00
Heavy breakable cast.	55.00 to 57.00
Cast iron car wheels	64.00 to 65.00
Malleable	68.00 to 69.00
Unstripped motor blocks	44.00 to 45.00
No. 1 machinery cast.	57.00 to 59.00

Cleveland

No. 1 hvy. melting	\$64.50 to \$65.50
No. 2 hvy. melting	48.00 to 49.00
No. 1 bundles	64.50 to 65.50
No. 1 factory bundles	71.00 to 72.00
No. 2 bundles	43.00 to 44.00
No. 1 busheling	64.50 to 65.50
Machine shop turn.	34.00 to 35.00
Mixed bor. and turn.	38.00 to 39.00
Shoveling turnings	38.00 to 39.00
Cast iron borings	38.00 to 39.00
Cut struct'r'l & plates, 2 ft & under	70.00 to 71.00
Drop forge flashings	65.50 to 66.50
Low phos. punch'gs plate	65.50 to 66.50
Foundry steel, 2 ft & under	62.00 to 63.00
No. 1 RR. heavy melting	70.00 to 71.00
Rails 2 ft and under	83.00 to 84.00
Rails 18 in. and under	84.00 to 85.00
Railroad grade bars	49.00 to 50.00
Steel axle turnings	44.00 to 45.00
Railroad cast.	61.00 to 62.00
No. 1 machinery cast.	56.50 to 57.50
Stove plate	53.00 to 54.00
Malleable	71.00 to 72.00

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Youngstown

No. 1 hvy. melting	\$66.50 to \$67.50
No. 2 hvy. melting	52.00 to 53.00
No. 1 bundles	66.50 to 67.50
No. 2 bundles	47.00 to 48.00
Machine shop turn.	34.00 to 35.00
Shoveling turnings	40.00 to 41.00
Cast iron borings	40.00 to 41.00
Low phos. plate	68.00 to 69.00

Buffalo

No. 1 hvy. melting	\$56.00 to \$57.00
No. 2 hvy. melting	46.00 to 47.00
No. 1 busheling	56.00 to 57.00
No. 1 bundles	56.00 to 57.00
No. 2 bundles	43.00 to 44.00
Machine shop turn.	30.00 to 31.00
Mixed bor. and turn.	32.00 to 33.00
Shoveling turnings	34.00 to 35.00
Cast iron borings	32.00 to 33.00
Low phos. plate	61.00 to 62.00
Scrap rails, random lgth.	57.00 to 58.00
Rails 2 ft and under	77.00 to 78.00
RR. steel wheels	60.00 to 61.00
RR. spring steel	60.00 to 61.00
RR. couplers and knuckles	70.00 to 71.00
No. 1 machinery cast.	52.00 to 53.00
No. 1 cupola cast.	48.00 to 49.00

Detroit

No. 1 hvy. melting	\$59.00 to \$60.00
No. 2 hvy. melting	50.00 to 51.00
No. 1 bundles, openhearth	60.00 to 61.00
No. 2 bundles	40.00 to 41.00
New busheling	59.00 to 60.00
Drop forge flashings	58.50 to 59.50
Machine shop turn.	29.00 to 30.00
Mixed bor. and turn.	32.00 to 33.00
Shoveling turnings	32.00 to 33.00
Cast iron borings	32.00 to 33.00
Low phos. punch'gs plate	59.00 to 60.00
No. 1 cupola cast.	51.00 to 52.00
Heavy breakable cast.	44.00 to 45.00
Stove plate	45.00 to 46.00
Automotive cast.	54.00 to 55.00

St. Louis

No. 1 hvy. melting	\$55.00 to \$56.00
No. 2 hvy. melting	45.00 to 46.00
No. 1 bundles	58.00 to 59.00
No. 2 bundles	41.00 to 42.00
Machine shop turn.	36.50 to 37.50
Cast iron borings	38.50 to 39.50
Shoveling turnings	38.50 to 39.50
No. 1 RR. hvy. melting	65.00 to 66.00
Rails, random lengths	79.00 to 80.00
Rails, 18 in. and under	83.00 to 84.00
Locomotive tires uncut	68.00 to 69.00
Angles and splice bars	70.00 to 71.00
Std. steel car axles	82.00 to 83.00
RR. specialties	70.00 to 71.50
Cupola cast.	49.00 to 50.00
Heavy breakable cast.	46.50 to 47.50
Cast iron brake shoes	52.00 to 53.00
Stove plate	44.00 to 45.00
Cast iron car wheels	56.00 to 57.00
Rerolling rails	68.00 to 69.00
Unstripped motor blocks	43.00 to 44.00

Boston

No. 1 hvy. melting	\$52.00 to \$53.00
No. 2 hvy. melting	39.00 to 39.50
No. 1 bundles	52.00 to 53.00
No. 2 bundles	37.50 to 38.50
No. 1 busheling	52.00 to 53.00
Elec. furnace, 3 ft & under	55.00 to 56.00
Machline shop turn.	20.00 to 21.00
Mixed bor. and short turn.	32.00 to 33.00
Shoveling turnings	34.00 to 35.00
Clean cast chem. borings	35.00 to 36.00
No. 1 machinery cast.	46.00 to 47.00
Mixed cupola cast.	42.00 to 43.00
Heavy breakable cast.	44.00 to 45.00
Stove plate	40.00 to 41.00
Unstripped motor blocks	32.00 to 33.00

New York

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$53.00 to \$54.00
No. 2 hvy. melting	43.00 to 44.00
No. 2 bundles	41.00 to 42.00
Machine shop turn.	31.50 to 32.50
Mixed bor. and turn.	31.50 to 32.50
Shoveling turnings	37.50 to 38.50
Clean cast chem. borings	35.00 to 36.00
No. 1 machinery cast.	51.00 to 52.00
Mixed yard cast.	46.00 to 47.00
Charging box cast.	47.00 to 48.00
Heavy breakable cast.	47.00 to 48.00
Unstripped motor blocks.	37.00 to 38.00

Birmingham

No. 1 hvy. melting	\$46.00 to \$47.00
No. 2 hvy. melting	44.00 to 45.00
No. 1 bundles	46.00 to 47.00
No. 2 bundles	38.00 to 39.00
No. 1 busheling	46.00 to 47.00
Machine shop turn.	36.00 to 37.00
Shoveling turnings	37.00 to 38.00
Cast iron borings	25.00 to 26.00
Electric furnace bundles	54.00 to 55.00
Structural and plate, 2 ft	58.00 to 59.00
Scrap rails, random lgth.	69.00 to 70.00
Rails, 18 in. and under	74.00 to 75.00
Angles & splice bars	66.00 to 67.00
Rerolling rails	77.00 to 78.00
No. 1 cupola cast.	52.00 to 53.00
Stove plate	51.00 to 52.00
Charging box cast.	40.00 to 41.00
Cast iron car wheels	45.00 to 46.00
Unstripped motor blocks	44.00 to 45.00
Mashed tin cans	15.00 to 16.00
Elec. furnace, 3 ft & under	52.00 to 53.00

Cincinnati

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$59.00 to \$60.00
No. 2 hvy. melting	49.00 to 50.00
No. 1 bundles	59.00 to 60.00
No. 2 bundles	43.00 to 44.00
Machine shop turn.	39.00 to 40.00
Mixed bor. and turn.	39.50 to 40.50
Shoveling turnings	42.00 to 43.00
Cast iron borings	39.50 to 40.50
Low phos. 18 in. & under	64.00 to 65.00
Rails, 18 in. and under	72.00 to 73.00
Rails, 18 in. and under	79.00 to 80.00
No. 1 cupola cast.	48.00 to 49.00
Heavy breakable cast.	47.00 to 48.00
Drop broken cast	58.00 to 59.00

San Francisco

No. 1 hvy. melting	\$54.00
No. 2 hvy. melting	52.00
No. 1 bundles	53.00
No. 2 bundles	43.00
Machine shop turn.	35.00
Cast iron borings	35.00
No. 1 RR. hvy. melting	55.00
No. 1 cupola cast	60.00

Los Angeles

No. 1 hvy. melting	\$54.00
No. 2 hvy. melting	52.00
No. 1 bundles	53.00
No. 2 bundles	40.00
Machine shop turn.	35.00
Shoveling turnings	38.00
Cast iron borings	35.00
No. 1 RR. hvy. melting	55.00
No. 1 cupola cast	60.00

Seattle

No. 1 hvy. melting	\$54.00
No. 2 hvy. melting	51.00
No. 2 bundles	35.00
No. 1 cupola cast	55.00
Mixed yard cast	55.00

Hamilton, Ont.

No. 1 hvy. melting	\$52.00
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Copper Production Higher

Deliveries in October take sharp rise . . . But output is up even more . . . Relationship in U. S. remains about the same . . . Foreign output passes deliveries.

♦ REFINED copper deliveries to consumers in October were up sharply over the previous month, both in the U. S. and overseas. But output from refineries was up even more.

The Copper Institute reports 113,353 tons of copper delivered to fabricators in the U. S. in October, as compared to 104,486 tons in September.

In the free world including the U. S., a total of 234,365 tons was delivered during October, compared to 219,479 tons during September.

Refined production in the U. S. last month jumped to 136,379 tons from 112,484 tons in September. Total free world refined output rose to 263,292 tons from 217,522 tons the previous month.

The fact that production exceeded deliveries is not a new trend in the market. The shift to excess of production began early in the fall, with the trend becoming more marked each week.

However, the latest move could be important to future market conditions. U. S. producers have already taken steps to balance the oversupply. Two major ones have reduced production, but failed to reverse the trend.

It may be that reduced output in the U. S. just isn't enough to balance production and deliveries. The relationship of deliveries to production stayed almost the same despite the bigger jump in domestic refining. On foreign markets, where little or no action was taken, production leads deliveries. It trailed in September.

Anaconda tried to drop production in Chile. The government made a request not to do so. The union, which had originally favored Anaconda, changed its position.

Clearing of the hazy situation in the Middle East could reverse the trend. It is likely that England and France need more copper for stepped up military activity. But the blocked Suez may be delaying these deliveries.

The dock strike on the eastern seaboard may be a factor in the London market. Copper bound for Europe can not move. If the strike is not settled soon, the London situation would tighten.

The effect of automotive buying on the copper market is overrated, says Roy H. Glover, chairman of Anaconda Co. Only about 8 pct of copper sold in the U. S. is consumed by automakers, reports Mr. Glover. He said the condition of the current market is caused by the fact that sales of such items as refrigerators and freezers, television sets, electric cookware and farm equipment were less active than last winter.

Primary Prices

(cents per lb.)	current price	last price	date of change
Aluminum ingot	27.10	25.90	11/10/56
Aluminum pig	25.00	24.00	11/10/56
Copper (E)	38.00	40.00	10/26/56
Copper (CS)	36.00	35.00	10/31/56
Copper (L)	36.00	40.00	10/27/56
Lead, E. St. L.	15.00	18.30	1/13/56
Lead, N. Y.	18.00	18.50	1/13/56
Magnesium ingot	36.00	34.50	11/12/56
Magnesium pig	35.25	33.75	11/12/56
Nickel	44.50	60.00	11/24/56
Titanium sponge	270-300	285-325	7/7/56
Zinc, E. St. L.	13.50	13.00	1/6/56
Zinc, N. Y.	14.00	13.50	1/6/56

ALUMINUM: 99% ingot frt allwd. **COPPER:** (E) = electrolytic, (CS) = custom smelters, electrolytic. (L) = lake. **LEAD:** common grade. **MAGNESIUM:** 99.8% pig. Velasco, Tex. **NICKEL:** Port Colbourne, Canada. **ZINC:** prime western. **TIN:** see column at right, other primary prices, pg. 140.

ALUMINUM . . . Domestic production for October was up over the previous month, reports the Aluminum Assn. The 149,127 tons turned out easily topped the 132,316 tons produced during September. In 1956 it is surpassed only by output during May and July. The latter was the all-time record month.

The total production for the year, through October, is 1,385,777 tons. This is noticeably higher than output at the same time last year, 1,291,349 tons.

If production continues at the present rate output for the year will be about 1,683,000 tons, easily a record. The old record was set last year, 1,565,783 tons.

Since 1952 the aluminum producers have set a new record every year. There seems little chance of this being reversed at least until 1960.

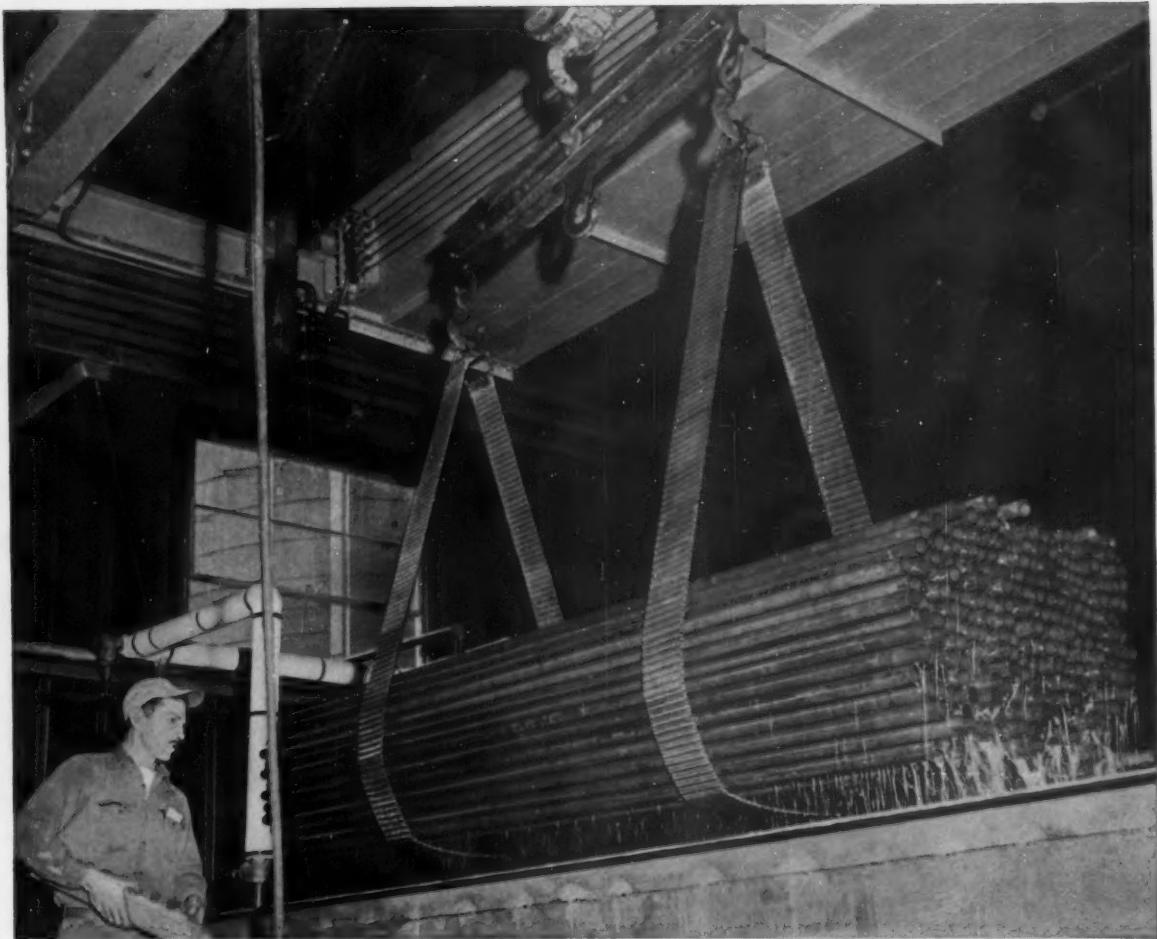
One of the reasons for the continuing increase in production was pointed up by Nathanael V. Davis, president of Aluminium Ltd. in a recent address before the New England Council. Mr. Davis reported that the number of aluminum using plants in the U. S. had increased six-fold during the past 10 years. There are now about 24,000. There were 4000 in 1946. The Aluminium Ltd. head estimates that this market will continue to grow and require 45 pct more aluminum in 1960 than it did in 1954.

TIN . . . The tin price is again headed up. The cease fire in the Middle East had caused a slight sag. It was doubtful that the price would have reached a level reflecting actual world production and demand. But the dock strike on the Eastern seaboard erases even that slight possibility.

Initially, the price reversed itself only slightly. Buyers turned to warehouses. However, warehouses located on or near the waterfront were forced to shut down because of a sympathy strike in support of the longshoremen.

The situation now resolves itself into the question of just what can be considered spot tin. Importers are hurriedly checking the buildings where their tin is stored. Those well out of the water front area are still operating.

Tin prices for the week: Nov. 14—109.00; Nov. 15—109.625; Nov. 16—112.375; Nov. 17—112.375; Nov. 19—112.375; Nov. 20—112.75*. *Estimate.



Gently does it...

Cradled in Monel Gripper Slings®, thin wall tubing is pickled in five-ton lots without mechanical damage to product. No carry-off or contamination of solution, either.

Versatile Monel lightens touch of Gripper Slings for thin wall tubing

Broad woven Gripper Slings® like these are a natural for handling thin wall tubing by the ton.

Large contact area supports without crushing and at the same time firms up the grip. Woven wire mesh construction protects against sudden failure, too.

Makes slings of Monel alloy for use in pickling service

For pickling thin wall tubing and similar products, Cambridge Wire Cloth Company normally recommends Gripper Slings fabricated from Monel* nickel-copper alloy wire.

With good reason. First, Monel alloy has outstanding resistance to the common solutions for pickling carbon steel. No need to use extra metal as a corrosion allowance. Second, Monel alloy has a very high strength-to-weight ratio. Thus a relatively thin wire may be used with complete safety.

Versatility solves many difficult pickling equipment problems

Monel alloy has proved one of the most useful of all pickling equip-

ment materials. It resists most pickling solutions. It can be drawn, cast, bent, welded, machined readily. It's tough, strong, long-lasting.

For a visual summary of the many pickling uses Monel alloy serves, write for "Equipping the Pickle House for Greater Production at Lower Cost." It's chock full of ideas.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.



Nickel Alloys

Monel...for proved pickling life

Nonferrous Prices (Effective Nov. 26, 1956)

MILL PRODUCTS

(Cents per lb, unless otherwise noted)

ALUMINUM

(Base 30,000 lb, f.o.b. ship. pt., frt. allowed)

Flat Sheet (Mill Finish) and Plate

("F" temper except 6061-0)

Alloy	.032	.081	.136	.250
			.249	.3
1800, 1100,				
3003.....	44.3	42.1	40.9	40.2
6052.....	51.8	46.8	45.1	42.9
6061-0.....	48.9	44.6	42.8	42.6

Extruded Solid Shapes

Factor	6063 T-5	6062 T-6
6-8.....	45.5-47.3	61.3-65.1
12-14.....	46.2-47.7	62.2-66.8
24-26.....	49.4-49.5	73.1-77.8
36-38.....	58.8-59.0	97.4-101.0

Screw Machine Stock—2011-T-3

Size"	3/4	5/16	3/4-1	1 1/4-1 1/4
Price	50.7	58.8	57.4	55.2

Roofing Sheet, Corrugated

(Per sheet, 26" wide base, 16,000 lb)

Length"	72	96	120	144
.019 gage.....	\$1.352	\$1.803	\$2.254	\$2.704
.024 gage.....	1.886	2.252	2.515	3.378

MAGNESIUM

(F.o.b. shipping Pt., carload frt. allowed)

Sheet and Plate

Type→	Gage→	.250-	.350-	.188	.081	.032
AZ31B Stand.		3.00	2.00			
Grade				67.9	69.0	77.9
AZ31B Spec.				93.3	95.7	108.7
Tread Plate				70.6	71.7	171.3
Tooling Plate				73.0		

Extruded Shapes

factor→	6-8	12-14	24-36	36-58
Comm. Grade (AZ31C)	60.6	70.7	75.6	89.2
Spec. Grade (AZ31B)	84.6	85.7	90.6	104.2

Alloy Ingots

AZ91B (Die Casting)..... 37.25 (delivered)

AZ63A, AZ92A, AZ91C (Sand Casting) 40.75 (Velasco, Tex.)

NICKEL, MONEL, INCONEL

(Base prices, f.o.b. mill)

"A" Nickel Monel	Inconel
Sheet, CR.....	113
Strip, CR.....	111
Rod, bar, HR.....	94
Angles, HR.....	94
Plates, HR.....	107
Seamless tube.....	144
Shot, blocks.....	120
	190
	78
	...

COPPER, BRASS, BRONZE

(Freight included on 5000 lbs)

	Sheet	Wire	Rod	Tube
Copper	57.63		54.86	57.82
Bram, 70/30	49.44	49.98	49.37	52.35
Bram, Low	52.65	53.19	52.50	55.46
Bram, R.L.	53.79	54.33	53.78	56.60
Bram, Naval	53.39		47.70	56.55
Munts Metal	51.44		47.25	
Comm. Bs.	55.48	56.02	55.42	58.04
Mang. Bs.	57.13		51.33	
Phos. Bs. 5%	76.25		76.75	

TITANIUM

(10,000 lb base, f.o.b. mill)

Sheet and strip, commercially pure, \$12.10-\$12.60; alloy, \$15.00-\$15.75; Plate, HR, commercially pure, \$10.00-\$10.50; alloy, \$11.50-\$12.00. Wire, rolled and/or drawn, commercially pure, 9.00-\$11.50; alloy, \$11.50; Bar, HR or forged, commercially pure, \$7.55-\$7.80; alloy, \$7.55-\$7.75.

PRIMARY METAL

(Cents per lb, unless otherwise noted)

Antimony, American, Laredo, Tex.	33.50
Beryllium aluminum 5% Be, Dollars per lb contained Be	74.75
Beryllium copper, per lb contained Be, \$43.00	
Beryllium 97% lump or beads, f.o.b. Cleveland, Reading	\$71.50
Bismuth, ton lots	\$2.25
Cadmium, del'd	\$1.70
Calcium, small lots	\$4.55
Chromium, 99.8% metallic basis	\$1.81
Cobalt, 97-99% (per lb)	\$2.60 to \$2.67
Germanium, per gm, f.o.b. Miami, Okla., refined	\$48.50
Gold, U. S. Treas., per troy oz.	\$35.00
Indium, 99.9% dollars per troy oz.	\$2.25
Iridium, dollars per troy oz.	\$90 to \$100
Lithium, 98%	\$11.00 to \$14.00
Magnesium, sticks, 100 to 500 lb.	59.00
Mercury, dollars per 76-lb flask, f.o.b. New York	\$255 to \$257
Nickel oxide sinter at Copper Cliff, Ont., contained nickel	\$6.75
Palladium, dollars per troy oz.	\$22 to \$24
Platinum, dollars per troy oz.	\$103 to \$105
Rhodium	\$120.00 to \$125.00
Silver ingots (¢ per troy oz.)	91.375
Thorium, per kg	\$43.00
Uranium, normal per kg	\$40.00
Vanadium	\$3.45
Zirconium sponge	\$10.00

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5 ingot	
No. 115	35.00
No. 120	33.75
No. 123	32.35
80-10-10 ingot	
No. 205	38.50
No. 315	36.75
88-10-2 ingot	
No. 210	48.75
No. 215	44.50
No. 245	40.00
Yellow ingot	
No. 405	27.50
Manganese bronze	
No. 421	30.75

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys	26.25-26.75
0.30 copper max.	26.00-26.50
0.60 copper max.	26.00-26.50
Piston alloys (No. 122 type)	26.00-26.50
No. 12 alum. (No. 2 grade)	22.50-24.75
108 alloy	24.00-25.00
195 alloy	26.50-27.00
13 alloy (0.60 copper max.)	26.00-26.50
AXS-679	24.00-26.00

Steel deoxidizing aluminum, notch bar granulated or shot

Grade 1—95-97½%	24.00-25.00
Grade 2—92-95%	23.25-24.00
Grade 3—90-92%	22.50-23.50
Grade 4—85-90%	21.75-22.50

SCRAP METALS

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

Heavy Turnings	
Copper	32
Yellow brass	24 1/2
Red brass	28 1/2
Comm. bronze	29 1/2
Mang. bronze	33 1/2
Yellow brass rod ends	24 1/2

Customs Smelters Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	
No. 2 copper wire	29 1/2
Light copper	27 1/2
No. 1 composition	28 1/2
Hvy. yellow brass solids	19 1/2
Brass pipe	20 1/2
Radiators	22 1/2
Aluminum	
Mixed old cast	16 1/2-17 1/2
Mixed new clips	17
Mixed turnings, dry	16 1/2-17

Dealers' Scrap

(Dealers' buying price, f.o.b. New York in cents per pound)

No. 1 copper wire	
No. 2 copper wire	26 1/2-27
Light copper	24-24 1/2
Auto radiators (unsweated)	17 1/2-18
No. 1 composition	23 1/2-24
No. 1 composition turnings	22-22 1/2
Cocks and faucets	18
Clean heavy yellow brass	15-15 1/2
Brass pipe	19-19 1/2
New soft brass clippings	20 1/2-21
No. 1 brass rod turnings	18-18 1/2
Zinc	
New zinc clippings	7
Old zinc	4 1/2
Zinc routings	2 1/2
Old die cast scrap	2 1/2-2 1/2
Nickel and Monel	
Pure nickel clippings	\$11.75-\$11.85
Clean nickel turnings	\$11.50-\$11.60
Nickel anodes	\$11.75-\$11.85
Nickel rod ends	\$11.75-\$11.85
New Monel clippings	80-90
Clean Monel turnings	70-80
Old sheet Monel	70-80
Nickel silver clippings, mixed	21
Nickel silver turnings, mixed	18
Lead	
Soft scrap lead	12 1/2-13
Battery plates (dry)	7
Batteries, acid free	4 1/2
Miscellaneous	
Block tin	80-81
No. 1 pewter	62 1/2-63
Auto babbitt	42-42 1/2
Mixed common babbitt	13-13 1/2
Solder joints	18-18 1/2
Siphon tops	42
Small foundry type	15 1/4-15 1/2
Monotype	14 1/2-15
Lino. and stereotype	13-13 1/2
Electrotype	12 1/2-12 1/2
Hand picked type shells	10-10 1/2
Lino. and stereo. dross	5 1/4-5 1/2
Electro. dross	4 1/4-4 1/2

IRON AGE STEEL PRICES <i>(Effective Nov. 20, 1956)</i>		<i>Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.</i>													
		BILLETS, BLOOMS, SLABS			PIL- ING		SHAPES STRUCTURALS			STRIP					
EAST	Carbon Hot-rolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide- Flange	Hot- rolled	Cold- rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot- rolled	Alloy Cold- rolled		
	Bethlehem, Pa.			\$107.00 <i>B3</i>		5.05 <i>B3</i>	7.40 <i>B3</i>	5.05 <i>B3</i>							
	Buffalo, N. Y.	\$74.00 <i>B3</i> , <i>R3</i>	\$91.50 <i>B3</i> , <i>R3</i>	\$107.00 <i>B3</i> , <i>R3</i>	5.90 <i>B3</i>	5.05 <i>B3</i>	7.40 <i>B3</i>	5.05 <i>B3</i>	4.875 <i>B3</i> , <i>R3</i>	6.85 <i>R7</i>	6.95 <i>B3</i>				
	Claymont, Del.														
	Harrison, N. J.												14.55 <i>C11</i>		
	Coopersburg, Pa.														
	New Bedford, Mass.														
	Johnstown, Pa.	\$74.00 <i>B3</i>	\$91.50 <i>B3</i>	\$107.00 <i>B3</i>		5.05 <i>B3</i>	7.40 <i>B3</i>								
	Boston, Mass.												14.90 <i>T8</i>		
	New Haven, Conn.														
	Baltimore, Md.														
	Phoenixville, Pa.					5.85 <i>P2</i>		5.85 <i>P2</i>							
	Sparrows Pt., Md.														
	Bridgeport, Wallingford, Conn.	\$79.00 <i>N8</i>	\$96.50 <i>N8</i>	\$107.00 <i>N8</i>									14.90 <i>N7</i>		
	Pawtucket, R. I.														
	Worcester, Mass.														
MIDDLE WEST	Alton, Ill.								4.875 <i>L1</i>						
	Ashland, Ky.								4.875 <i>A7</i>						
	Canton-Massillon, Dover, Ohio									6.85 <i>G#</i>	10.10 <i>G#</i>		14.55 <i>G4</i>		
	Chicago, Ill. Franklin Park, Ill.	\$74.00 <i>U1</i> , <i>R3</i>	\$91.50 <i>U1</i> , <i>R3,W8</i>	\$107.00 <i>U1</i> , <i>R3,W8</i>	5.90 <i>U1</i>	5.00 <i>U1</i> , <i>W1</i>	7.35 <i>U1,Y1</i>	5.00 <i>U1</i>	4.875 <i>N4</i>	6.95 <i>A1,T8</i>			7.75 <i>W8</i> <i>S9</i>	14.55 <i>A1</i> , <i>S9,T8</i>	
	Cleveland, Ohio									6.85 <i>A5,J3</i>				7.75 <i>J3</i>	
	Detroit, Mich.	\$74.00 <i>R5</i>		\$107.00 <i>R5</i>					4.775 <i>G3</i> , <i>M2</i>	6.95 <i>M2,G3</i> , <i>D2,P11</i>	7.05 <i>G3</i>	10.10 <i>G3</i> , <i>SI,D2</i>	7.05 <i>G3</i>		
	Anderson, Ind.									6.85 <i>G#</i>		10.10 <i>G#</i>			
	Duluth, Minn.														
	Gary, Ind. Harbor, Indiana	\$74.00 <i>U1</i>	\$91.50 <i>U1</i>	\$107.00 <i>U1</i> , <i>Y1</i>	5.90 <i>J3</i>	5.00 <i>U1</i>	7.35 <i>U1,I3</i>	5.00 <i>I3</i>	4.875 <i>U1</i> , <i>I3,Y1</i>	5.85 <i>Y1</i>	6.95 <i>U1</i> , <i>I3,Y1</i>	10.20 <i>Y1</i>	7.75 <i>U1</i> , <i>Y1</i>		
	Sterling, Ill.	\$74.00 <i>N6</i>							4.775 <i>N4</i>						
	Indianapolis, Ind.									7.35 <i>C5</i>				7.75 <i>N5</i>	
	Newport, Ky.														
	Middletown, Ohio														
	Niles, Warren, Ohio Sharon, Pa.								4.875 <i>SI</i> , <i>R3</i>	6.85 <i>T4</i>	6.95 <i>SI</i> , <i>R3</i>	10.00 <i>SI</i> , <i>R3</i>	7.75 <i>SI</i>	14.55 <i>SI</i>	
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	\$74.00 <i>U1</i> , <i>J3</i>	\$91.50 <i>U1</i> , <i>J3,C11</i>	\$107.00 <i>U1</i> , <i>C11</i>	5.90 <i>U1</i>	5.00 <i>U1</i> , <i>J3</i>	7.35 <i>U1</i> , <i>J3</i>	5.00 <i>U1</i>	4.875 <i>P6</i>	5.750 <i>P6</i> , 6.85 <i>J3,B4</i> , <i>S7</i>				7.75 <i>S9</i>	14.55 <i>S9</i>
	Portsmouth, Ohio														
	Weirton, Wheeling, Follansbee, W. Va.						5.00 <i>W3</i>			4.875 <i>W3</i>	6.85 <i>W3,F3</i>	6.95 <i>W3</i>	9.65 <i>W3</i>		
	Youngstown, Ohio	\$74.00 <i>R3</i>	\$91.50 <i>Y1</i> , <i>C10</i>	\$107.00 <i>Y1</i>		5.00 <i>Y1</i>	7.35 <i>Y1</i>		4.875 <i>U1</i> , <i>Y1</i>	6.85 <i>Y1,C5</i>	6.95 <i>U1</i> , <i>Y1</i>	10.20 <i>Y1</i>	7.75 <i>U1</i> , <i>Y1</i>		
WEST	Fontana, Cal.	\$83.50 <i>K1</i>	\$101.00 <i>K1</i>	\$128.00 <i>K1</i>		5.70 <i>K1</i>	8.05 <i>K1</i>	5.85 <i>K1</i>	5.475 <i>K1</i>	8.50 <i>K1</i>					
	Geneva, Utah	\$91.50 <i>C7</i>				5.00 <i>C7</i>	7.35 <i>C7</i>								
	Kansas City, Mo.					5.10 <i>S2</i>	7.45 <i>S2</i>		4.925 <i>S2</i>		7.20 <i>S2</i>				
	Los Angeles, Torrance, Cal.					5.70 <i>C7</i> , <i>B2</i>	8.05 <i>B2</i>		5.425 <i>B2</i> , <i>C7</i>	8.80 <i>C7</i>				8.95 <i>B2</i>	
	Minnequa, Colo.					5.30 <i>C6</i>			5.775 <i>C6</i>						
	Portland, Ore.					5.75 <i>O2</i>									
	San Francisco, Niles, Pittsburg, Cal.					5.65 <i>B2</i>	8.00 <i>B2</i>		5.425 <i>C7,B2</i>						
	Seattle, Wash.					5.75 <i>B2</i>	8.10 <i>B2</i>		5.875 <i>B2</i>						
SOUTH	Atlanta, Ga.								4.875 <i>A8</i>						
	Fairfield, Ala. City, Birmingham, Ala.	\$74.00 <i>T2</i>	\$91.50 <i>T2</i>			5.00 <i>T2,R3</i>	7.35 <i>T2</i>		4.875 <i>T2,R3</i>	6.95 <i>T2</i>					
	Houston, Lone Star, Texas	\$80.00 <i>L3</i>	\$96.50 <i>S2</i>	\$112.00 <i>S2</i>		5.10 <i>S2</i>	7.45 <i>S2</i>		4.925 <i>S2</i>	7.20 <i>S2</i>					

**STEEL
PRICES**

(Effective Nov. 20, 1956)

 Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

	SHEETS								WIRE ROD	TINPLATE†		BLACK PLATE	
	Hot-rolled 18 ga. & heavier	Cold- rolled	Galvanized	Enameling	Long Terne	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.		Cakes* 1.25-lb. base box	Electro* 0.25-lb. base box		
												Holloware Enameling 29 ga.	
EAST	Bethlehem, Pa.												
	Buffalo, N. Y.	4.675 B3	5.75 B3				6.90 B3	8.525 B3			5.80 W6		
	Claymont, Del.												
	Coatesville, Pa.												
	Conshohocken, Pa.	4.725 A2	5.80 A2				6.95 A2						
	Harrisburg, Pa.												
	Hartford, Conn.												
	Johnstown, Pa.										5.80 B3		
	Fairless, Pa.	4.725 U1	5.80 U1				6.95 U1	8.575 U1				\$3.80 U1	
	New Haven, Conn.												
	Phoenixville, Pa.												
	Sparrows Pt., Md.	4.675 B3	5.75 B3	6.30 B3			6.90 B3	8.575 B3	9.275 B3		5.90 B3	\$3.80 B3	
	Worcester, Mass.										6.10 A5		
	Trenton, N. J.												
MIDDLE WEST	Alton, Ill.										6.90 L1		
	Ashland, Ky.	4.675 A7		6.30 A7	6.325 A7								
	Canton-Massillon, Dever, Ohio			6.30 R3, R1									
	Chicago, Joliet, Ill.	4.675 W8, A1					6.90 U1				5.80 K2	5.80 A5, R3, N4, W8, K2	
	Sterling, Ill.											5.80 N4, K2	
	Cleveland, Ohio	4.675 J3, R3	5.75 J3, R3		6.325 R3		6.90 R3	8.525 R3, J3				5.80 A5	
	Detroit, Mich.	4.775 G3, M2	5.85 G3 5.75 M2				7.00 G2	8.625 G3					
	Newport, Ky.	4.675 A9	5.75 A9										
	Gary, Ind. Harbor, Indiana	4.675 U1, I3, Y1	5.75 U1, I3, Y1	6.30 U1, I3	6.325 U1, I3, Y1	6.70 U1	6.90 U1, Y1, I3	8.525 U1, Y1		5.80 Y1	\$3.70 U1, Y1	\$3.40 I3, U1, Y1	
	Granite City, Ill.	4.875 G2	5.95 G2	6.50 G2	6.325 G2							\$3.50 G2	
	Kekoma, Ind.			6.40 C9							5.90 C9		
	Mansfield, Ohio		5.75 E2			6.70 E2							
	Middletown, Ohio	5.75 A7	6.30 A7	6.325 A7	6.70 A7								
	Niles, Warren, Ohio Sharon, Pa.	4.675 S1, R3, N3	5.75 R3	6.30 R3	6.325 N3	6.70 N3	6.90 S1, R3	8.525 S1, R3				\$3.40 R3	
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	4.675 U1, J3, P6	5.75 U1, J3, P6	6.30 U1, J3	6.325 U1		6.90 U1, J3, R3	8.525 U1, J3	9.275 U1		5.80 A5, P6, J3	\$3.70 J3, U1	\$3.40 U1
	Portsmouth, Ohio	4.675 P7	5.75 P7								5.80 P7		
	Weirton, Wheeling, Follansbee, W. Va.	4.675 W3, W5	5.75 W3, W5, F3	6.30 W3, W5		6.70 W3, W5	6.90 W3	8.525 W3				\$3.80 W5	7.15 W3 7.40 W3
	Youngstown, Ohio	4.675 U1, Y1	5.75 Y1		6.325 Y1		6.90 Y1	8.525 Y1			5.80 Y1		7.15 Y1
WEST	Footana, Cal.	5.475 K1	6.95 K1				7.70 K1	9.725 K1				\$10.35 K1	\$9.85 K1
	Geneva, Utah	4.775 C7											
	Kansas City, Mo.											6.05 S2	
	Los Angeles, Terrance, Cal.											6.60 B2	
	Minnequa, Colo.											6.85 C6	
	San Francisco, Niles, Pittsburg, Cal.	5.375 C7	6.70 C7	7.85 C7							6.45 C7	\$10.45 C7	\$9.15 C7
	Seattle, Wash.												
SOUTH	Atlanta, Ga.												
	Fairfield, Ala. Alabama City, Ala.	4.675 T2, R3	5.75 T2, R3	6.30 T2, R3							5.80 T2, R3	\$3.80 T2	\$3.50 T2
	Houston, Tex.										6.85 S2		

IRON AGE

STEEL PRICES

(Effective Nov. 20, 1956)

 Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

	BARS						PLATES			WIRE
	Carbon † Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	
										Mfr's. Bright
EAST	Bethlehem			6.125 B3	8.325 B3	7.40 B3				
	Buffalo, N. Y.	5.075 B3,R3	5.075 B3,R3	6.90 B5	6.125 B3,R3	8.325 B5,B3	7.40 B3	4.85 B3		
	Claymont, Del.							5.35 C4	6.85 C4	7.55 C4
	Coatesville, Pa.							5.25 L4	6.85 L4	7.55 L4
	Conshohocken, Pa.							4.90 A2	5.925 A2	7.25 A2
	Harrisburg, Pa.							5.80 P2	6.275 C3	
	Hartford, Conn.			7.35 R3		8.625 R3	7.40 B3			
	Johnstown, Pa.	5.075 B3	5.075 B3		6.125 B3			4.85 B3		6.85 B3
	Fairless, Pa.	5.225 U1	5.225 U1		6.275 U1					7.20 B3
	Newark, N. J.			7.30 W10		8.58 W10				
	Camden, N. J.			7.30 P10		8.50 P10				
	Bridgeport, Conn.	5.30 N8	7.20 N8 7.40 W10	6.20 N8	8.475 N8	7.50 N8				
	Sparrows Pt., Md.		5.075 B3					4.85 B3		6.85 B3
	Palmer, Worcester, Readville, Mass. Milton, Pa.	5.225 M7	5.225 M7	7.40 B5,C14		8.325 A5 8.625 B3				7.50 A5,W6
	Spring City, Pa.			7.30 K4		8.50 K4				9.025 78
MIDDLE WEST	Alton, Ill.	5.275 L1								7.40 L1
	Ashland, Newport, Ky.							4.85 A7,N5	6.85 N5	
	Canton, Massillon, Ohio		6.85 R3,R2	6.125 R3,T5	8.325 R3,R2, T5					
	Chicago, Joliet, Ill.	5.075 U1,R3, W8,N4 5.575 P13	6.85 A5,B5, W10,L2, W8,L2,N9	6.125 U1,R3, W8	8.325 A5,B5, W8,L2,N9, W10	8.875 N8	4.85 U1,J3, W8,A1	5.925 U1	6.85 U1,W8	7.25 U1
	Cleveland, Ohio	5.075 R3	5.075 R3	6.85 A5,C13		8.325 A5,C13	7.425 R3	4.95 J3,R3	5.925 J3	7.25 J3,R3
	Detroit, Mich.	5.175 G3	5.425 G3	7.05 B5,P8 7.10 P3 6.85 R5	6.225 G3 6.125 R5	8.525 B5,P3, P8 8.325 R5	7.525 G3	4.95 G3		6.90 G3
	Duluth, Minn.									
	Gary, Ind. Harbor, Crawfordsville	5.075 U1,I3, Y1	5.075 U1,I3, Y1	6.85 R3,M5	6.125 U1,I3, Y1	8.325 R3,M4	7.425 U1,I3, Y1	4.85 U1,I3, Y1	5.925 J3	6.85 U1,Y1
	Granite City, Ill.							5.05 G2		
	Kakomo, Ind.									7.30 C9
	Sterling, Ill.	5.525 N4	5.175 N4							7.30 K2
	Niles, Warren, Ohio Sharon, Pa.			6.85 C10	6.125 C10,S1	8.325 C10	7.425 S1	4.85 S1,R3		6.85 S1
	Pittsburgh, Pa.	5.075 U1, C11,J3	5.075 U1,J3	6.85 A5,C8, J3,R3,S9, B4,W10	6.125 U1,C11	8.325 A5,R3, S9,C8,W10, C11	7.425 U1,J3	4.85 U1,J3	5.925 U1	6.85 U1,J3
	Midland, Pa.									7.25 U1,J3, P6
	Portsmouth, Ohio									7.20 P7
	Weirton, Wheeling, Fellowsbee, W. Va.							4.85 W5		
	Youngstown, Ohio	5.075 U1, Y1,R3	5.075 U1, Y1,R3	6.85 U1,Y1, F2	6.125 U1,Y1	8.325 Y1,F2	7.425 U1,Y1	4.85 U1,Y1, R3		6.85 Y1
WEST	Emeryville, Cal.	5.825 J5	5.825 J5							
	Fontana, Cal.	5.775 K1	5.775 K1		7.175 K1		8.125 K1	5.55 K1		7.55 K1
	Geneva, Utah	5.175 C7						4.85 C7		7.25 C7
	Kansas City, Mo.	5.325 S2	5.325 S2		6.375 S2		7.675 S2			
	Los Angeles, Terrance, Cal.	5.775 C7,B2	5.775 C7,B2	8.30 R3	7.175 B2		8.125 B2			
										7.45 S2
										8.15 B2
	Minnequa, Colo.	5.525 C6	5.525 C6					5.70 C6		7.45 C6
	Portland, Ore.	5.825 O2	5.825 O2							
	San Francisco, Niles, Pittsburgh, Cal.	5.775 C7,P9 5.825 B2	5.775 C7,P9 5.825 B2				8.175 B2			8.15 C7,C6
	Seattle, Wash.	5.825 B2 5.825 N6	5.825 B2				8.175 B2	5.75 B2		7.75 B2
										8.15 B2
SOUTH	Atlanta, Ga.	5.575 A8								7.40 A8
	Fairfield, Ala. City, Birmingham, Ala.	5.075 T2,R3 5.375 C16	5.075 T2,R3 5.375 C16				7.425 T2	4.85 T2,R3		7.25 T2
	Houston, Ft. Worth, Lone Star, Tex.	5.325 S2	5.325 S2		6.375 S2		7.675 S2	4.95 S2 5.26 L3	6.95 S2	7.35 S2
										7.45 S2

† Merchant Quality—Specialty Quality .35¢ higher.

Steel Prices (Effective Nov. 20, 1956)

Key to Steel Producers

With Principal Offices

A1	Acme Steel Co., Chicago
A2	Alan Wood Steel Co., Conshohocken, Pa.
A3	Allegheny Ludlum Steel Corp., Pittsburgh
A4	American Cladmetals Co., Carnegie, Pa.
A5	American Steel & Wire Div., Cleveland
A6	Angell Nail & Chaplet Co., Cleveland
A7	Arco Steel Corp., Middletown, Ohio
A8	Atlantic Steel Co., Atlanta, Ga.
A9	Acme-Newport Steel Co., Newport, Ky.
B1	Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2	Bethlehem Pacific Coast Steel Corp., San Francisco
B3	Bethlehem Steel Co., Bethlehem, Pa.
B4	Blair Strip Steel Co., New Castle, Pa.
B5	Bliss & Laughlin Inc., Harvey, Ill.
B6	Brook Plant, Wickwire Spencer Steel Div., Birdsboro, Pa.
C1	Calstrip Steel Corp., Los Angeles
C2	Carpenter Steel Co., Reading, Pa.
C3	Central Iron & Steel Co., Harrisburg, Pa.
C4	Claymore Products Dept., Claymont, Del.
C5	Cold Metals Products Co., Youngstown, O.
C6	Colorado Fuel & Iron Corp., Denver
C7	Columbia Geneva Steel Div., San Francisco
C8	Columbia Steel & Shafing Co., Pittsburgh
C9	Continental Steel Corp., Kokomo, Ind.
C10	Copperweld Steel Co., Pittsburgh, Pa.
C11	Crucible Steel Co. of America, Pittsburgh
C12	Cumberland Steel Co., Cumberland, Md.
C13	Cuyahoga Steel & Wire Co., Cleveland
C14	Compressed Steel Shafing Co., Readville, Mass.
C15	G. O. Carlson, Inc., Thorndale, Pa.
C16	Connors Steel Div., Birmingham
C17	Chester Blast Furnace, Inc., Chester, Pa.
D1	Detroit Steel Corp., Detroit
D2	Detroit Tube & Steel Div., Detroit
D3	Driver Harris Co., Harrison, N. J.
D4	Dickson Weatherproof Nail Co., Evanston, Ill.
D5	Henry Dillont Div., Philadelphia
E1	Eastern Stainless Steel Corp., Baltimore
E2	Empire Steel Co., Mansfield, O.
F1	Firth Sterling, Inc., McKeepport, Pa.
F2	Fitzsimons Steel Corp., Youngstown

F3	Follansbee Steel Corp., Follansbee, W. Va.
G2	Granite City Steel Co., Granite City, Ill.
G3	Great Lakes Steel Corp., Detroit
G4	Greer Steel Co., Dover, O.
H1	Hanna Furnace Corp., Detroit
I2	Ingersoll Steel Div., Chicago
I3	Inland Steel Co., Chicago
I4	Interlake Iron Corp., Cleveland
J1	Jackson Iron & Steel Co., Jackson, O.
J2	Jessop Steel Corp., Washington, Pa.
J3	Jones & Laughlin Steel Corp., Pittsburgh
J4	Joslyn Mfg. & Supply Co., Chicago
J5	Judson Steel Corp., Emeryville, Calif.
K1	Kaiser Steel Corp., Fontana, Cal.
K2	Keystone Steel & Wire Co., Peoria
K3	Koppers Co., Granite City, Ill.
K4	Keystone Drawn Steel Co., Spring City, Pa.
L1	Laclede Steel Co., St. Louis
L2	La Salle Steel Co., Chicago
L3	Lone Star Steel Co., Dallas
L4	Lukens Steel Co., Coatesville, Pa.
M1	Mahoning Valley Steel Co., Niles, O.
M2	McLouth Steel Corp., Detroit
M3	Mercer Tube & Mfg. Co., Sharon, Pa.
M4	Mid-States Steel & Wire Co., Crawfordsville, Ind.
M5	Monarch Steel Div., Hammond, Ind.
M6	Mystic Iron Works, Everett, Mass.
M7	Milton Steel Products Div., Milton, Pa.
N1	National Supply Co., Pittsburgh
N2	National Tube Div., Pittsburgh
N3	Niles Rolling Mill Div., Niles, O.
N4	Northwestern Steel & Wire Co., Sterling, Ill.
N5	Northwest Steel Rolling Mills, Seattle
N7	Newman Crosby Steel Co., Pawtucket, R. I.
N8	Northeastern Steel Corp., Bridgeport, Conn.
N9	Nelson Steel & Wire Co.
O1	Oliver Iron & Steel Co., Pittsburgh
O2	Oregon Steel Mills, Portland
P1	Page Steel & Wire Div., Monessen, Pa.
P2	Phoenix Iron & Steel Co., Phoenixville, Pa.
P3	Pilgrim Drawn Steel Div., Plymouth, Mich.
P4	Pittsburgh Coke & Chemical Co., Pittsburgh
P5	Pittsburgh Screw & Bolt Co., Pittsburgh
P6	Pittsburgh Steel Co., Pittsburgh
P7	Portsmouth Div., Detroit Steel Corp., Detroit
P8	Plymouth Steel Co., Detroit
P9	Pacific States Steel Co., Niles, Cal.
P10	Precision Drawn Steel Co., Camden, N. J.
P11	Production Steel Strip Corp., Detroit
P13	Phoenix Mfg. Co., Joliet, Ill.
P14	Pacific Tube Co.
R1	Reeves Steel & Mfg. Co., Dover, O.
R2	Reliance Div., Eaton Mfg. Co., Massillon, O.
R3	Republic Steel Corp., Cleveland
R4	Roehling Sons Co., John A., Trenton, N. J.
R5	Rotary Electric Steel Co., Detroit
R6	Rodney Metals, Inc., New Bedford, Mass.
R7	Rome Strip Steel Co., Rome, N. Y.
S1	Dearborn Div., Sharon Steel Corp., Sharon, Pa.
S2	Sheffield Steel Div., Kansas City
S3	Shenango Furnace Co., Pittsburgh
S4	Simonds Saw and Steel Co., Fitchburg, Mass.
S5	Sweet's Steel Co., Williamsport, Pa.
S6	Standard Forging Corp., Chicago
S7	Stanley Works, New Britain, Conn.
S8	Superior Drawn Steel Co., Monaca, Pa.
S9	Superior Steel Corp., Carnegie, Pa.
S10	Seneca Steel Service, Buffalo
T1	Tonawanda Iron Div., N. Tonawanda, N. Y.
T2	Tennessee Coal & Iron Div., Fairfield
T3	Tennessee Products & Chem. Corp., Nashville
T4	Thomas Strip Div., Warren, O.
T5	Timken Steel & Tube Div., Canton, O.
T7	Texas Steel Co., Fort Worth
T8	Thompson Wire Co., Boston
U1	United States Steel Corp., Pittsburgh
U2	Universal-Cyclops Steel Corp., Bridgeville, Pa.
U3	Ulrich Stainless Steels, Wallingford, Conn.
U4	U. S. Pipe & Foundry Co., Birmingham
W1	Wallingford Steel Co., Wallingford, Conn.
W2	Washington Steel Corp., Washington, Pa.
W3	Weirton Steel Co., Weirton, W. Va.
W4	Wheatland Tube Co., Wheatland, Pa.
W5	Wheeling Steel Corp., Wheeling, W. Va.
W6	Wickwire Spencer Steel Div., Buffalo
W7	Wilson Steel & Wire Co., Chicago
W8	Wisconsin Steel Div., S. Chicago, Ill.
W9	Woodward Iron Co., Woodward, Ala.
W10	Wyckoff Steel Co., Pittsburgh
W12	Wallace Barnes Steel Div., Bristol, Conn.
Y1	Youngstown Sheet & Tube Co., Youngstown, O.

PIPE AND TUBING

Base discounts (per cent) f.o.b. mills. Base price about \$200 per net ton.

STANDARD T. & C.	BUTTWELD												SEAMLESS												
	1/2 in.		3/4 in.		1 in.		1 1/4 in.		1 1/2 in.		2 in.		2 1/2-3 in.		2 in.		2 1/2 in.		3 in.		3 1/2-4 in.				
	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	
Sparrows Pt. B3	10.50	+4.75	13.50	+0.75	16.00	2.75	18.50	3.50	19.00	4.50	19.50	5.00	21.00	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown R3	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fontana K1	9.00	+15.25	3.00	+1.25	18.00	+1.75	20.50	+7.00	20.50	+6.00	20.50	+5.50	21.00	+5.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh J3	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	+2.00	+17	4.50	+12.25	7.00	+9.75	8.50	+8.25	.....	.....
Alton, Ill. L1	10.50	+4.75	13.50	+0.75	18.00	2.75	18.50	3.50	19.00	4.50	19.50	5.00	21.00	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sharon M3	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fairless N2	16.50	+4.75	13.50	+0.75	18.00	2.75	18.50	3.50	19.00	4.50	19.50	5.00	21.00	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh N1	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	+2.00	+17	4.50	+12.25	7.00	+9.75	8.50	+8.25	.....	.....
Wheeling W5	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheeland W4	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown Y1	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	+2.00	+17	4.50	+12.25	7.00	+9.75	8.50	+8.25	.....	.....
Indiana Harbor Y1	11.50	+5.75	14.50	+1.25	17.00	3.75	19.50	4.50	20.00	5.50	20.50	6.00	22.00	5.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lerain N2	12.50	+2.75	15.50	+1.25	18.00	4.75	20.50	5.50	21.00	6.50	21.50	7.00	23.00	6.75	+2.00	+17	4.50	+12.25	7.00	+9.75	8.50	+8.25	.....	.....
EXTRA STRONG PLAIN ENDS	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sparrows Pt. B3	15.00	1.25	19.00	5.25	21.00	8.75	21.50	7.50	22.00	8.50	22.50	9.00	23.00	7.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown R3	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fairless N2	15.00	1.25	19.00	5.25	21.00	8.75	21.50	7.50	22.00	8.50	22.50	9.00	23.00	7.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fontana K1	4.50	.....	8.50	.....	10.50	.....	11.00	.....	11.50	.....	12.00	.....	12.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh J3	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	+0.50	+14.50	7.00	+8.75	9.50	+6.25	14.50	+1.25	.....	.....
Alton, Ill. L1	15.00	1.25	19.00	5.25	21.00	8.75	21.50	7.50	22.00	8.50	22.50	9.00	23.00	7.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sharon M3	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh N1	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	+0.50	+14.50	7.00	+8.75	9.50	+6.25	14.50	+1.25	.....	.....
Wheeling W5	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheeland W4	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown Y1	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	+0.50	+14.50	7.00	+8.75	9.50	+6.25	14.50	+1.25	.....	.....
Indiana Harbor Y1	16.00	2.25	20.00	6.25	22.00	9.75	22.50	8.50	23.00	9.50	23.50	10.50	24.00	9.75	+0.50	+14.50	7.00	+8.75	9.50	+6.25	14.50	+1.25	.....	.....
Lerain N2	17.00	3.25	21.00	7.25	23.00	10.75	23.50	9.75	24.00	10.50	24.50	11.00	25.00	9.75	+0.50	+14.50	7.00	+8.75	9.50	+6.25	14.50	+1.25	.....	.....

Threads only, butt-welded and seamless 2 1/2 pt. higher discount. Plain ends, butt-welded and seamless, 2-in. and under, 5 1/2 pt. higher discount.
 Galvanized discounts based on zinc price range of over 9¢ to 11¢ per lb. East St. Louis. For each 2¢ change in zinc, discounts vary as follows: 1/2, 3/4 and 1-in., 2 pt.; 1 1/4, 1 1/2 and 2-in., 3-in., 1 pt., e.g., zinc price range of over 13¢ to 15¢ would lower discounts on 2 1/2" and 3" pipe by 2 points; zinc price in range over 7¢ to 9¢ would increase discounts. A East St. Louis zinc price now 13.50¢ per lb.

(Effective Nov. 20, 1956)

TOOL STEEL

F.o.b. mill	W	Cr	V	Mo	Co	per lb	SAE
	18	4	1	—	—	\$1.68	T-1
	18	4	1	—	5	2.385	T-4
	18	4	2	—	—	1.845	T-2
	1.5	4	1.5	8	—	1.04	M-1
	6	4	3	6	—	1.43	M-3
	6	4	2	5	—	1.185	M-2

High-carbon chromium.. .83 D-3, D-5
Oil hardened manganese.. .45 O-2
Special carbon..... .41 W-1
Extra carbon..... .345 W-1
Regular carbon..... .29 W-1
Warehouse prices on and east of Mississippi are 4¢ per lb higher. West of Mississippi, 6¢ higher.

CLAD STEEL

Basis prices, cents per lb f.o.b.

Cladding	Plate (A3, J2, L6)			Sheet (J2)		
	10 pct	15 pct	20 pct	20 pct	20 pct	20 pct
302				33.25		
304	34.60	38.00	41.50	35.25		
316	39.70	43.20	46.65	52.25		
321	36.35	39.80	43.50	42.00		
347	39.50	43.95	48.45	51.00		
405	29.20	32.15	37.05	.....	
410, 430	28.70	32.65	36.55	.....	

CR Strip (89) Copper, 10 pct, 2 sides, 40.65; 1 side, 33.40.

ELECTRICAL SHEETS

F.o.b. Mill	22-Gage	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length)	
			Semi- Processed	Fully Processed
Field	9.00	9.20	.....
Armature	10.35	10.85	.....
Elect.	11.00	11.525	.....
Motor	12.05	12.575	.....
Dynamo	13.05	13.55	.....
Trans. 72	14.05	14.55	.....
Trans. 65	14.60	.....	.....
			Grain Oriented	
Trans. 58	15.10	Trans. 88	15.50
Trans. 52	16.15	Trans. 73	19.00

Producing points: Beech Bottoms (W5); Brackenridge (A9); Granite City (G7); Indiana Harbor (I3); Mansfield (E2); Newport, Ky. (N9); Niles, O. (N3); Vandergrift (U1); Warren, O. (R3) (2¢ higher, HR); Zanesville, Butler (A7).

LAKE SUPERIOR ORES

51.50% Fe natural content, delivered lower Lake ports. Prices for 1956 season. Freight changes for seller's account.

	Gross Ton
Open-hearth lump	\$12.10
Old range, bessemer	11.25
Old range, nonbessemer	11.10
Mesabi, bessemer	11.00
Mesabi, nonbessemer	10.85
High phosphorus	10.85

To identify producers, see Key on preceding page

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard Q Coated Nails		Woven Wire Fence		Single Loop Bale Ties		Galv. Barbed and Twisted Barbless Wire		March. Wine Amt'd		March. Wine Galv.	
	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	
Alabama City R3	167	181	195	187	8.10	8.50						
Alliquip, Pa. J3***	164	179	181	181	7.95	8.475						
Atlanta A8**	166	182	192	190	8.05	8.65						
Bartonsville K2**	166	182	192	190	8.05	8.65						
Buffalo W6												
Chicago, Ill. N4**	164	180	187	188	7.95	8.55						
Cleveland A6	173	188	192	190	8.10	8.60						
Cleveland A5												
Crawfordsville M4**	166	182	192	190	8.05	8.65						
Daytona, Pa. A5	164	176	190	184	7.95	8.15						
Duluth A5	164	176	190	184	7.95	8.15						
Fairfield, Ala. T2	164	176	190	184	7.95	8.15						
Galveston D4	180	188	195	189	8.20	8.60						
Houston S2	169	181	195	189	8.20	8.60						
Johnstown, Pa. B3**	164	180	187	188	7.95	8.55						
Joliet, Ill. A3	164	176	190	184	7.95	8.35						
Kokomo, Ind. C9**	166	178	192	186	8.05	8.45						
Los Angeles B2**	169	181	195	189	8.20	8.60						
Kansas City S2*	169	181	195	189	8.20	8.60						
Minneapolis C6	169	181	195	189	8.20	8.60						
Monessen P6	167	185	195	191	8.10	8.50						
Pittsburgh C17	166	199	204	198	8.90	9.30						
Portsmouth P7												
Rankin, Pa. A5	164	176	184	175	7.95	8.35						
St. Louis R3	167	181	195	187	8.10	8.50						
S. San Francisco C5												
Sparrows Pt. B3**	166	182	195	189	8.20	8.65						
Struthers, O. Y1*												
Worcester A5	170											
Williamsport, Pa. S1			175									

* Zinc less than .10¢. † Plus zinc extras.

** 12.5 zinc. ‡ Wholesalers only.

*** .10¢ zinc.

C-R SPRING STEEL

F.o.b. Mill	CARBON CONTENT					
	0.26- 0.40	0.41- 0.60	0.61- 0.80	0.81- 1.05	1.06- 1.35	
Baltimore, Md. T8	8.25	10.10	12.90	15.30	18.25	
Bristol, Conn. W12						
Boston T8	8.50	10.10	12.90	15.30	18.25	
Buffalo, N. Y. R7	7.95	9.80	12.60	15.00	17.95	
Carnegie, Pa. S9	†	9.80	12.60	15.00	17.95	
Cleveland A5	7.95	9.80	12.60	15.00	17.95	
Detroit D1	8.05	9.90	12.70	15.10	17.95	
Detroit D2	8.05	9.90	12.70	15.10	17.95	
Deer, O. G4	7.95	9.80	12.60	15.00	17.95	
Franklin Park, Ill. T8	8.05	9.80	12.60	15.00	17.95	
Harrison, N. J. C11	8.10	9.95	12.60	15.00	17.95	
Indianapolis C5	7.95	9.80	12.60	15.00	17.95	
New Castle, Pa. B4	8.40	10.10	12.90	15.30	18.25	
New Haven, Conn. D1	8.40	10.10	12.90	15.30	18.25	
Pawtucket, R. I. N7	8.50	10.10	12.90	15.30	18.25	
Pittsburgh S7	7.95	9.80	12.60	15.00	17.95	
Rivertown, Ill. A1	8.05	9.80	12.60	15.00	17.95	
Skaneate, Pa. S1	7.95	9.80	12.60	15.00	17.95	
Trenton R4	10.10	12.90	15.30	18.25		
Wallingford W1	8.40	10.10	12.90	15.30	18.25	
Warren, Ohio T4	7.95	9.80	12.60	15.00	17.95	
Weirton, W. Va. W3	7.95	9.80	12.60	15.00	17.95	
Worcester, Mass. A5	8.50	10.10	12.90	15.30	18.25	
Youngstown C5	7.95	9.80	12.60	15.00	17.95	

* On Application.

BOILER TUBES

F.o.b. Mill	Size		Seamless		Elec. Weld	
	OD- In.	B.W. Ga.	H.R. C.D.	H.R. C.D.		
Babcock & Wilcox	2	13	34.88	46.85	33.21	
	2½	12	46.98	55.01	33.73	
	3	12	54.24	63.53	51.66	
	3½	11	63.32	74.16	60.30	
	4	10	84.09	98.47	80.07	
National Tube	2	13	34.88	46.85	33.21	
	2½	12	46.98	55.01	33.73	
	3	12	54.24	63.53	51.66	
	3½	11	63.32	74.16	60.30	
	4	10	84.09	98.47	80.07	
Pittsburgh Steel	2	13	34.88	46.85		
	2½	12	46.98	55.01		
	3	12	54.24	63.53		
	3½	11	63.32	74.16		
	4	10	84.09	98.47		

** F.O.B. Plant, warehouse price.

† Deduct for country delivery.

Base Quantities (Standard unless otherwise keyed): Cold finished bars: 2000 lb or over. Alloy bars: 1000 to 1999 lb. All others: 2000 to 4999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may not be combined with each other or with galvanized sheets for quantity.

** F.O.B. Plant, warehouse price.

† Deduct for country delivery.

Ferroalloy Prices

(Effective Nov. 20, 1956)

Ferrocchrome

Contract prices, cents per lb contained Cr, lump, bulk, carloads, del'd.	67-71%
Cr, 30-1.00% max. Si	
0.03% C .. 41.50	0.20% C .. 38.50
0.03% C .. 41.00	0.50% C .. 38.25
0.06% C .. 39.50	1.00% C .. 37.50
0.10% C .. 39.00	1.50% C .. 37.35
0.15% C .. 38.75	2.00% C .. 37.25
4.00-4.50% Cr, 67.70% Cr, 1-2% Si, 27.75	
2.50-5.00% Cr, 57-64% Cr, 2.00-4.50% Si	27.75
0.025% C (Simplex) ..	34.75
0.10% C, 50-52% Cr, 2% max. Si	35.75
0.50% max. C, 50-55% Cr, 3-6% Si	24.00
0.50% C, 50-55% Cr, 3% max. Si	24.00

High Nitrogen Ferrocrome

Low-carbon type 0.75% N. Add \$4 per lb to regular low carbon ferrocrome max. 0.10% C price schedule. Add \$4 for each additional 0.25% of N.

Chromium Metal

Contract prices, per lb chromium contained, packed, delivered, ton lots, 97% min. Cr, 1% max. Fe.	\$1.81
0.10% max. C ..	1.81
9 to 11% C, 33-91% Cr, 0.75% Fe..	1.40

Electrolytic Chromium Metal

Contract prices per lb of metal 2" x D plate (1/4" thick) delivered packed, 99.80% min. Cr (Metallic Base) Fe 0.20 max.	
Carloads	\$1.29
Ton lots	1.31
Less ton lots	1.33

Low Carbon Ferrocrome Silicon

(Cr 34-41%, Si 42-45%, C 0.05% max.) Contract price, carloads, delivered, lump, 3-in. x down, per lb of Cr, packed.	
Carloads	44.65
Ton lots	48.95
Less ton lots	51.45

Calcium-Silicon

Contract price per lb of alloy, lump, delivered, packed.	
30-33% Cr, 60-65% Si, 3.00 max. Fe.	
Carloads	25.65
Ton lots	27.95
Less ton lots	29.45

Calcium-Manganese—Silicon

Contract prices, cents per lb of alloy, lump, delivered, packed.	
16-20% Ca, 14-18% Mn, 53-59% Si.	
Carloads	24.25
Ton lots	26.15
Less ton lots	27.15

SMZ

Contract prices, cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe 1/4 in. x 13 mesh.	
Ton lots	20.15
Less ton lots	21.40

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, V-5; 38-42% Cr, 17-19% Si, 8-11% Mn, packed.	
Carload lots	17.20
Ton lots	18.70
Less ton lots	19.95

Graphidex No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, Si 48 to 52%, Ti 9 to 11%, Ca 5 to 7%.	
Carload packed	18.50
Ton lots to carload packed	19.65
Less ton lots	20.90

Ferromanganese

Maximum contract base price, f.o.b. lump size, base content 74 to 76 pct Mn.	
Producing Point per-lb	

Marietta, Ashtabula, O.: Alloy, W. Va.; Sheffield, Ala.; Portland, Ore.	11.75
Johnstown, Pa.	11.75
Sheridan, Pa.	11.75
Philo, Ohio	11.75
S. Duquesne	11.75
Add or subtract 0.1¢ for each 1 pct Mn above or below base content.	
Briquets, delivered, 66 pct Mn:	
Carloads, bulk	12.90
Ton lots packed	16.30

Spirgeleisen

Contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.	
Manganese Silicon	
16 to 19% 3% max.	397.50
19 to 21% 3% max.	99.50
21 to 23% 3% max.	102.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.	
95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.	
Carload, packed	45.75
Ton lots	47.25

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, f.o.b. Marietta, O., delivered, cents per pound.	
Carloads	33.00
Ton lots	35.00
250 to 1999 lb	27.00
Previous for hydrogen - removed metal	0.75

Medium Carbon Ferromanganese

Mn 30 to 85%, C 1.25 to 1.50, Si 1.50% max. Contract price, carloads, lump, bulk, delivered, per lb of contained Mn..	24.15
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Low-Carb Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd Mn 35-50%.	
Carloads Ton Less	
0.07% max. C, 0.06% P, 90% Mn ..	35.20 38.60 33.80
0.07% max. C ..	33.75 36.55 27.75
0.10% max. C ..	33.00 35.80 27.00
0.15% max. C ..	32.25 35.05 26.25
0.30% max. C ..	30.75 33.55 24.75
0.50% max. C ..	30.25 33.05 24.25
0.75% max. C, 80.85% Mn ..	27.25 30.05 31.25

Silicomanganese

Contract basis, lump size, cents per pound of metal, 65-68% Mn, 18-20% Si, 1.5% max. C for 2% max. C, deduct 0.2¢ f.o.b. shipping point.	
Carloads bulk	12.25
Ton lots	14.00
Briquet contract basis carloads, bulk, delivered, per lb of briquet	14.40
Ton lots, packed	16.80

Silvery Iron (electric furnace)

SI 15.50 to 16.00 pet, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., \$100.00 gross ton, freight allowed to normal trade area.	
SI 15.00 to 15.50 pet, f.o.b. Niagara Falls, N. Y., \$93.00	
Ton lots	20.15
Less ton lots	21.40

Silicon Metal

Contract price, cents per pound contained Si, lump, bulk, carloads, f.o.b. shipping point.	
50% Si ..	13.50 75% Si .. 16.40
65% Si ..	15.25 85% Si .. 18.16
90% Si ..	19.50

Calcium Metal

Easter zone contract prices, cents per pound of metal, delivered.	
Cast Turnings Distilled	
Ton lots	\$2.05 \$3.95 \$3.75
Less ton lots	1.40 3.80 4.55

Ferrovanadium

50-55% V contract, basis, delivered, per pound, contained V, carloads, packed.	
Openhearth	3.20
Crucible	3.20
High speed steel (Primos)	3.40

Alsifer, 20% Al, 40% Si, 40% Fe,

Contract basis, f.o.b. Suspension Bridge, N. Y., per lb.	
Carloads	10.65¢
Ton lots	11.80¢

Calcium molybdate, 43.6-46.6%

f.o.b. Langelo, Pa., per pound	
Contained Mo ..	\$1.28

Ferrocolumbium, 50-60%, 2 in. x D

Contract basis, delivered per pound contained Cb.	
Ton lots	\$6.90
Less ton lots	6.35

Ferro-tantalum-columbium, 20%

Ta, 40% Cr, 0.30% C, contract basis, del'd ton lots, 2-in. x D per lb cont'd \$8 plus Ta ..	
Ton lots	\$4.95

Ferromolybdenum, 55-75%, 200-lb

containers, f.o.b. Langelo, Pa., per pound contained Mo ..	
Ton lots	\$1.54

Ferrophosphorus, electric, 23-26%

car, 24% max. Fe, 2-in. x D, per ton ..	
Ton lots	\$90.00
Less ton lots	\$110.00

Ferrotitanium, 40% regular grade, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti ..

per lb contained Ti ..	
Ton lots	\$1.25

Ferrotitanium, 25% low carbon, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti ..

per lb contained Ti ..	
Ton lots	\$1.50

Fe rotungsten, M x down, packed, per pounds contained W, ton lots delivered ..

ton lots	
Less ton lots	\$3.15

Molybdenum oxide, 86-89% V₂O₅

contract basis, per pound contained V ₂ O ₅ ..	
Ton	

RAILWAY EQUIPMENT FOR SALE

Used - As Is - Reconditioned

RAILWAY CARS

All Types

SERVICE-TESTED®

FREIGHT CAR REPAIR PARTS

For All Types of Cars

LOCOMOTIVES

Diesel, Steam, Gasoline,
Diesel-Electric

SPECIAL OFFERINGS

1—BROWNING No. 3 DIESEL LOCOMOTIVE CRANE

Standard Gauge 27½-Ton Capacity

1—MODEL 15 BURRO

CRANE

Standard Gauge

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RAILWAY TANK CARS and STORAGE TANKS

6,000- 8,000- and 10,000-Gallon

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"ANYTHING containing IRON or STEEL"

THE CLEARING HOUSE

News of Used and Rebuilt Machinery

Moving Upward . . . The Cleveland area—traditionally a reliable barometer of industrial activity—reports increased activity in the used machinery field in recent weeks. Most logical explanations are the psychological lift from national election results and the increase in auto production schedules.

The Supply Dragnet . . . On a broad average, good quality machine shop tools, press brakes, lathes, and boring mills are bringing up to 70 pct of the price of comparable new equipment around Cleveland. Tightness of used equipment is for all practical purposes the limiting factor on the business a used machinery dealer can do in the area. One top notch dealer predicts his volume for this year will be down 25 pct from last year because there simply isn't enough good used equipment available. And most salesmen spend more time trying to find used equipment to buy than they do selling.

Auto Business Helps . . . Most concrete reason for upgrading machinery in Cleveland in the last few weeks is enlargement of auto supplier schedules. Many smaller suppliers who had been holding off purchasing larger or faster equipment have now committed themselves as a result of increased auto production schedules.

What They Want . . . Some of the harder-to-get machines are conventional presses and vertical and horizontal boring mills. Late models of the latter, from about 1948 on, are difficult for dealers to locate and anything older is snubbed by customers. Even models over 10 years old will bring 60 pct of the cost of a new one today if in top notch condition. Late model press brakes are also hard to locate and find a ready market

even though deliveries on new ones are relatively short term.

The Big Hunt . . . Efforts of tool dealers in the Chicago area to boost their sagging inventories are assuming aspects of a knock-down-drag-out battle. Older equipment is being cannibalized for spare parts, where standard parts can be interchanged. This artificial drain on an already extremely tight tool market seems to be the last straw breaking the camel's back. A number of small dealers report losing sales simply because they couldn't locate the desired machine tool in the time allowed by the customer. In several cases, bidding for used tools has gone better than 50 pct over what was regarded one year ago as a fair used tool price.

Tight Circle . . . Used tool customers are in much the same situation. The value of auctions is being reduced, simply because tools from an abandoned plant are not put up for auction. Owners, in several cases, have preferred to ship the tools to some other plant site. It's all producing a tight circle of increased tool scarcity, then higher prices. Some automatic equipment is being sold as much as 100 pct above year-ago price levels.

There seem to be virtually no soft spots in the overall picture. Automatic screw machines, softer early this year, are now in strong demand. Planers and grinders, lathes, surface grinders, where available are being shipped out of the area on rush calls. Dealer inventories are low, and the demand picture is still in process of tightening.

Considerable quantities of material continue to move south from Chicago, particularly into the Kansas City area. Thus far, there are no indications of a letup.

CONSIDER GOOD USED EQUIPMENT FIRST

BENDER & STRAIGHTENER

#4 H & J. Capacity 15" I-beams, 9" Girder Bells,
100 lb. Tee Bells, Motor Drive

BENDING ROLLS

6' x 1/16" Niagara Initial Type

8' x 1/4" Webb 128-V Vertical

10' x 1/4" Berthach Initial Type

10' x 1/4" Kling Pyramid Type

12' x 1/4" Southward Pyramid Type

12' x 1/4" Southward Pyramid Type

20' x 1/2" Hillies & Jones Pyramid Type

SHAKES—LEAF TYPE

10' x 2 1/8" Drews & Krump

12' x 1/4" Drews & Krump

12' x 1/4" Drews & Krump

SHAKES—PRESS TYPE

10' x 1/4" Superior Hydraulic—NEW

12' x 1/4" Superior Hydraulic—NEW

10' x 1/4" Cincinnati—LATE

12' x 1/4" Niagara—LATE

CRANES—OVERHEAD ELECTRIC TRAVELING

5 ton Shaw 60' Span 220/3/60 A.C.

5 ton Shaw 60' Span 220 Volt D.C.

10 ton Cyclops 40' Span 220/448 A.C.

15 ton PAH 40' Span 220 Volt D.C.

25 ton L-B 75' Span 220/3/60 A.C.

Incl. 300 ft. Runway

50 ton Niles 75' Span 220 Volt D.C.

120 ton Niles 65' Span 440/3/60 A.C.

FORGING MACHINES

1" to 5" Acme, Ajax, National

3" Ajax-Air Clutch

HAMMERS—BROAD DROP—STEAM DROP—STEAM FORGING—800 lb. to 20,000 lb.

Manufacturing

Confidential Certified Appraisals

Liquidations — Bona Fide Auction Sales Arranged

REBUILT — GUARANTEED ELECTRICAL EQUIPMENT

PACKAGE MILL DRIVES IN STOCK

1500-HP G.E. millimeter, rev. 600-VDC, 150/300 R.P.M., and 1250-H.P. M.G. Set, 600-VDC with 1750-HP, 8 P.F. synchronous motor, 2300/4100-Volt, 3 phase, 60 or 25 cycle. Designed for variable voltage drive, all enclosed, forced ventilated.

IDEAL REEL DRIVES

(2) 600-HP Allis-Chalmers mill motors, 600-VDC, 300/600 B.P.M., with a 1200-KW, 600-VDC Westinghouse M.G. Set, 1750-HP synchronous motor, 4100/2200-Volt, 3 phase, 60 cycle.

(2) 275-HP Westinghouse mill type motors, 230-Volt, 425/850 R.P.M., 2 or 3-unit, 500-KW M.G. Set, 250-VDC and 900-HP synchronous motor, 2300-Volt, 3 phase, 60 cycle.

(2) 100-HP Electro-Dynamic motors, 220-VDC, 450/1350 R.P.M., with 3-unit, 300-KW Allis-Chalmers M.G. Set, 2300/440-Volt, 3 phase, 60 cycle.

SPECIAL

(2) 800-HP Westinghouse mill motors, 220-VDC, 110/220 R.P.M., anti-friction pedestal bearings.

MOTOR GENERATOR SETS

Qu.	K.W.	RPM	Make	Volt DC	Volts AC
1	1250	720	G.E.	600	2300/4100
1	1000	720	Whse.		2300/4100
1	500	1200	Whse.	125/250	2300/440
1	500	720	Cv. Cr.	575/600	2300
1	200	1200	Al. Ch.		3-phase
		3-phase		250	2300
1	300	1200	G.E.	250	2300
1	200	1200	Cr. Wh.	250	2300
1	200	1200	Elliott	125	4000/2300
1	200	600	G.E.	250	2300
1	175	1200	G.E.	250	410/320
2	150	1200	Whse. SK	250	2300/440
2	150	1200	Reliance	125	2300/440
1	150	1200	G.E.	250	2300
1	100	1200	Whse. SK	125/250	440/220
1	100	1200	Al. Ch.	250	4600/2300

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4302 Clarissa St., Philadelphia 40, Penna.

Code Address Phone
"Macsteel" Philadelphia, Pa. Davenport 4-8300

Cold Mill 6"x5" Standard 2 Hi, Roller Bgs.
Leveler 17 Roll Backed Up Type 3" x 30".
Leveler 5 Roll, Heavy Duty 5/4"x30".
Recoiler 6" x 30" Broden Downcollar.
Grinder 24" Continuous Strip Mattison 424.
Press OBI 85 Ton WFF&M, Flywheel, at 24"
shear.
Compressor 5 HP Brunner Tank Type 150# air.

F. H. CRAWFORD & COMPANY, INC.
30 Church Street New York 7, N. Y.

LEVELERS—ROLLER

14" Newbold, Nine Rolls 4" Dia.
54" Acton Standard, 17 Rolls 3 1/2" Dia.
72" McKay, 17 Rolls 4" Dia.

PRESSES—HYDRAULIC

500 ton Elmes 18" Stroke Lower Plates 38" x 66"
750 ton Baldwin Triple Acting Bolster 34" x 133"

1250 ton United Steam Hydraulic Forging Press

4500 ton Baldwin-Lima-Hamilton Hydr. Forging Press

HYDRAULIC WHEEL

600 ton N-B-P, 90° Between Strain Bars

800 ton N-B-P, 90° Between Strain Bars

PRESSES—INCLINED

125 ton Beatty Open Back, 1 1/4" Stroke, Area of Bed

28% x 26%

PRESSES—STRAIGHT SIDE

Clearing Model TFA1500-200 Triple Acting Strokes

40 32" x 14" Bed Area 100" x 200"

180 ton Cleve. G Single End, 1 1/4" x 26" Bed

250 ton Bilas, 18" Stroke, 25" x 29" Bed

250 ton Toledo, 8" Stroke, 35" x 72" Bed

PUNCH—BEAM

#7 Kling Universal Punch, Capacity Punch 1 1/4" x 1"

118 Ton Punches in Range & web of H-Beams,

I-Beams & Channels

PUNCHES—SHEAR COMBINATIONS

MS-10 Punch 14" x 14", Capacity Punch 3/4" x 1 1/4".

Shear 1 1/4" Rd. 1 1/4" Sq. 3 x 3 1/4" Angles

#44 x 4 Buffalo RAP, Capacity 3/4" x 1 1/4".

Cleveland Style G Single End, 60° Thread

No. 14 Buffalo Universal Ironworker

ROLLS—PLATE STRAIGHTENING

72" Berthch Seven Rolls, 7" Dia.

88" H & J, Six Rolls 10" Dia.

12" Newbold, Nine Rolls 14" Dia.

RE-NU-BILT GUARANTEED ELECTRIC POWER EQUIPMENT A. C. MOTORS

3 phase—60 cycle

SLIP RING

Qu.	H.P.	Make	Type	Volts	Speed
2	1500	G.E.	M-579B	4800	1800
1	1100	G.E.	MT	6600	257
1	1000	F.M.	OVZK, B.B.	4800	1800
1	800	A.C.	MII	2300	240
1	750	G.E.	MT	2300	293
1	700	G.E.	MT-578	2300	1180
1	600	G.E.	MT	2300	1000
1	500	A.C.	MT	2300	293
1	500	Whse.	CW	550	320
1	400	Whse.	CW-960A	440	1170
1	400	Whse.	CW	440	514
1	400	Whse.	CW-1213	2200	455
1	350	G.E.	IM-17A	440/2200	720
1	250	G.E.	MT-424Y	4000	257
1	250	G.E.	MT-559B	2300	1000
1	250	Al. Ch.		500	600
1	200	Or. Wh.	2QB	440	505
1	200	G.E.	IM	440	435
1	200	G.E.	IM	2300	580
1	150 (unused)	Whse.	CW	3200	435
1	125	A.C.		440	865
1	100	G.E.	IM-18	2200	435
1	100	G.E.	CS	440	600
4	100	A.C.	ANY	440	695

SQUIRREL CAGE

Qu. H.P.	Make	Type	Volts	RPM	
1	800	G.E.	KT-573	2200	1180
3	650	G.E.	FT-559B	440	3570
2	450	Whse.	CS-1420	2300/4150	554
1	400	G.E.	IR	2200	554
1	300	G.E.	IK-17	440	588
3	200	G.E.	KT-557	440	1800
1	150/75	G.E.	KT-557	440/900/1800	554
1	150	Whse.	CS856S	440	860
2	125	Whse.	CS	440	580
2	125	Al. Ch.	ARW	2200	1750

SYNCHRONOUS

Qu. H.P.	Make	Type	Volts	RPM	
1	7000	G.E.	ATI	2200/6600	600
1	4350	C.W.	ES15L400B/5000/13800	514	
1	2850	Whse.	.8 p.f.	2200/4600	514
1	2800	Whse.		2300	120
2	2000	G.E.	ATI	2200/12000	600
2	1700	G.E.	ATI	2200/12000	600
2	1700	G.E.	ATI	2200/12000	600
1	735	G.E.	ATI	2200/12000	600
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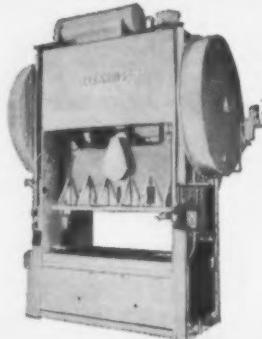
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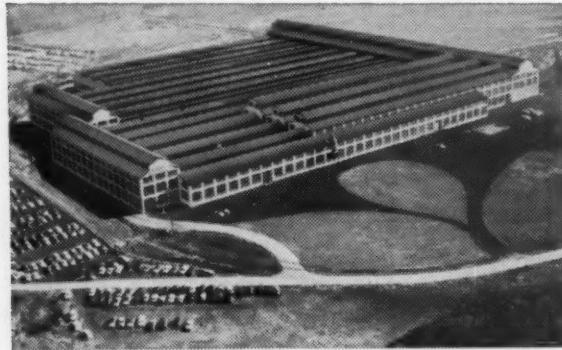


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The theme of the 1957 IRON AGE Annual Issue

JANUARY 3

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COVERED IN DETAIL will be . . . the 1957 Market—forecast of markets for all leading metals; Markets for Metalworking—market outlook for more than a score of metalworking industries, and major articles on aluminum, copper, steel; New Customers—5 Every Minute—effects of population growth, geographic trends on expansion and plant location; America's No. 1 Customer—where spending emphasis of Uncle Sam's "billions in business" will be; and America's No. 1 Information Source—where to find your best marketing information PLUS . . . Production and Price Data, Trade Association Directory, and other reference-value features essential to metalworking management planning.

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MACLEOD offers complete designing, fabrication, and installation of abrasive blast cleaning rooms, abrasive reclaiming systems, blast generators, and dust collecting systems—designed to meet your specific needs.

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Machines for
Sawing All Kinds
of Metals*

**THE ESPEN-LUCAS MACHINE WORKS
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GOSS and DE LEEUW

MULTIPLE SPINDLE
CHUCKING MACHINES

Four, Five, Six, Eight Spindles • Work and Tool Rotating Type
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 CONSULTING ENGINEERS**

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Sources for every need in the Metalworking industry.

Use reply postcard on Page 113 to request further information on products advertised in this issue.

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more and more manufacturers
 are saying: "Let's use

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 COLD ROLLED STRIP STEEL"**



Made to your specifications in all thicknesses from .012 to .375 inches and widths from $\frac{1}{4}$ " to 19" depending upon gauge.

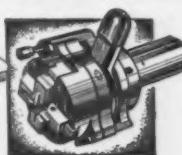
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 Pacific Coast Representative: A. C. Behringen, Inc., 234 N. San Pedro St., Los Angeles, California. Canada: F. F. Barber Machinery Co., Toronto, Canada

No Oil Shortage Seen For U. S.

Users of industrial oil and other petroleum products have little to fear from shortages regardless of the possibility that this country will ship some oil to Free Europe. The U. S. is making it clear that whatever it does to help ease the European pinch won't be at the expense of domestic users; won't cause rationing here.

Price Hike Asked By British Steel

British steelmakers are putting pressure on the Iron and Steel Board, government regulatory body, for higher prices. Increasing costs are more than offsetting a price hike granted last May, producers say. They are also asking that replacement costs be given a bigger margin when figuring depreciation, reserves and profit.

Tubing With I. D. Specs Available

Joseph T. Ryerson & Son, Inc., announced that it is offering cold drawn seamless mechanical tubing in stock made to standard inside diameter tolerances. It is believed the first time such a product has been made available by any warehouse. It is a comparatively low-cost material for production of honed cylinders, Ryerson states. Sizes available range from 2" through 9".

Raytheon Gets \$9 Million Radar Order

The Civil Aeronautics Administration is ordering \$9 million worth of radar gear from Raytheon Mfg. Co., in a major step to improve the nation's busy air-traffic system. Radar networks will be thrown up around 23 cities. It is the start of a \$246 million traffic control program due for completion in three years.

Stock Split Asked for National Supply

Directors of National Supply Co. have authorized a two-for-one split in the company's common stock, subject to approval by stockholders on Jan. 8, 1957. The split would increase the number of authorized shares of common stock from 2.5 million to 5 million. Par value would be lowered from \$10 to \$5.

Conveyor Advice Offered By Canadians

A guide for building screw conveyors, recommended to bulk manufacturers as inexpensive and easy to maintain, is made available to American industry by the Canadian National Research Council through the Office of Technical Services, U. S. Dept. of Commerce.

Edsel To Swell Employment

Ford's new medium-priced Edsel, scheduled for introduction next fall, will mean a 15,000 increase in hourly workers; 15,000 more supplier employees; 30,000 new dealer employees.

An asterisk beside the name of advertiser indicates that a booklet, or other information, is offered in the advertisement. Write to the manufacturer for your copies today.

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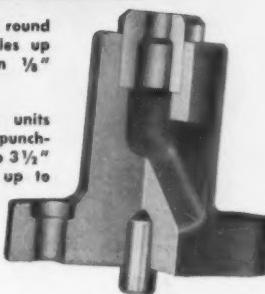
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WALES
CD UNITS
*increased our
 hole punching
 profits!*

For punching round or shaped holes up to 2" dia. in $\frac{1}{8}$ " mild steel.

Other WALES units available for punching holes up to $3\frac{1}{2}$ " dia. in stock up to $\frac{3}{4}$ " thick.



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CD Units are mounted in sets — outside the press. Change set-ups in 'jig time'. All parts are interchangeable. Maintenance costs are pared to the bone. Alignment is automatic and accurate. Press down-time is practically non-existent. For multiple hole punching, nothing equals the speed and simplicity of WALES CD punch and die assemblies.



Showing WALES CD Units in same set-up with WALES BL Hole Punching Units and WALES Type N Notching Units in punch press.

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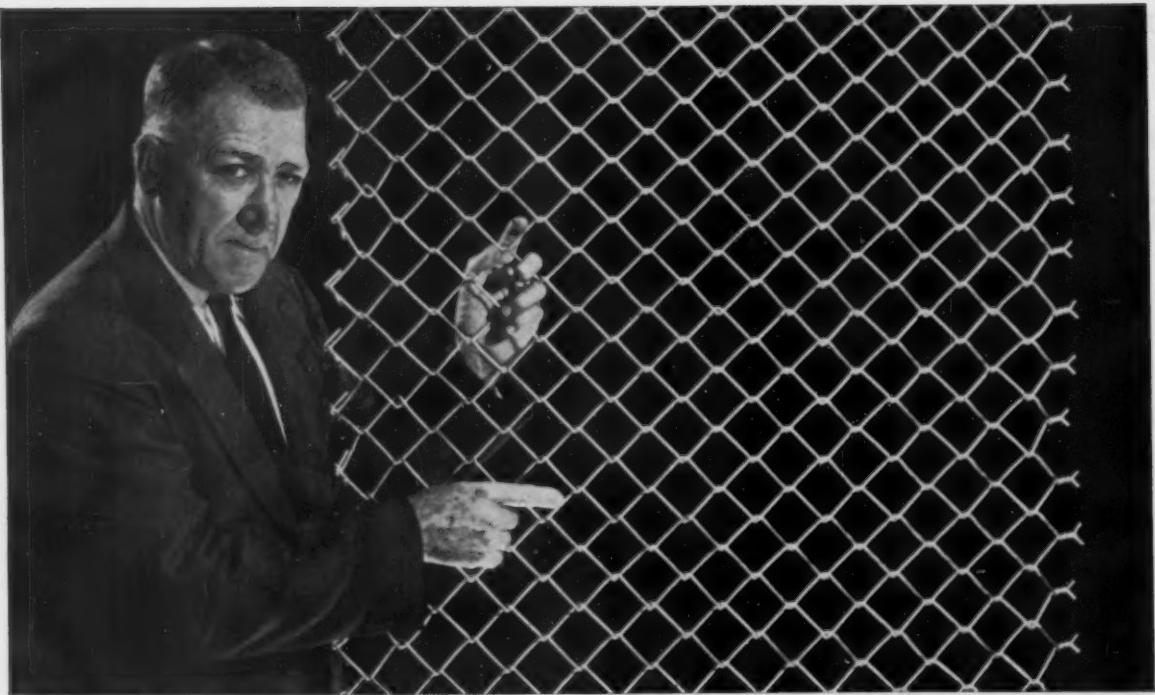
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cause of the tight bond of pure zinc on steel. Fence erectors like bethanized fence because the wires are not rough and won't slash fingers.

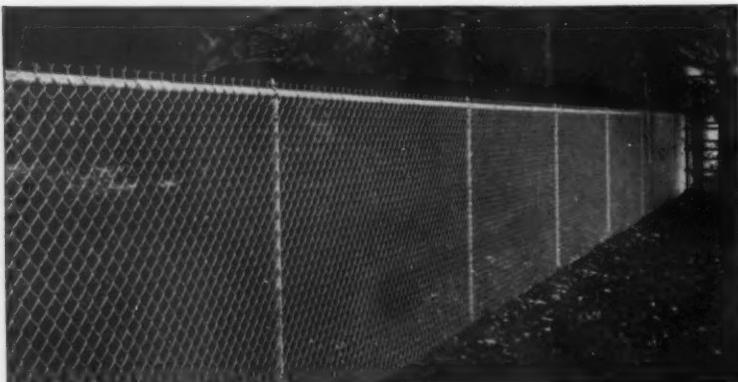
Pure zinc, tightly bonded to steel ... that's bethanized wire

There are no thin spots in the beth-

anized zinc armor to give rust a foothold. The electrolytic process deposits a coating that is uniform over every inch of the wire.

Bethanized wire is ideal for twisted wire brushes, chain, conveyor belts and other products which require severe forming, swaging, cold-heading, and thread-rolling. You can bend it, twist it around its own diameter—even draw it through dies to fine gage. The pure zinc stays on.

Whether you need hard or soft-temper wire, light or heavy zinc coatings, we will be glad to ship you a trial order of bethanized. Just phone or write our nearest sales office for full details.



The bethanized coating of pure zinc adds extra years of service to chain-link fence. Photo courtesy: Atlas Fence Co., Philadelphia, Pa.

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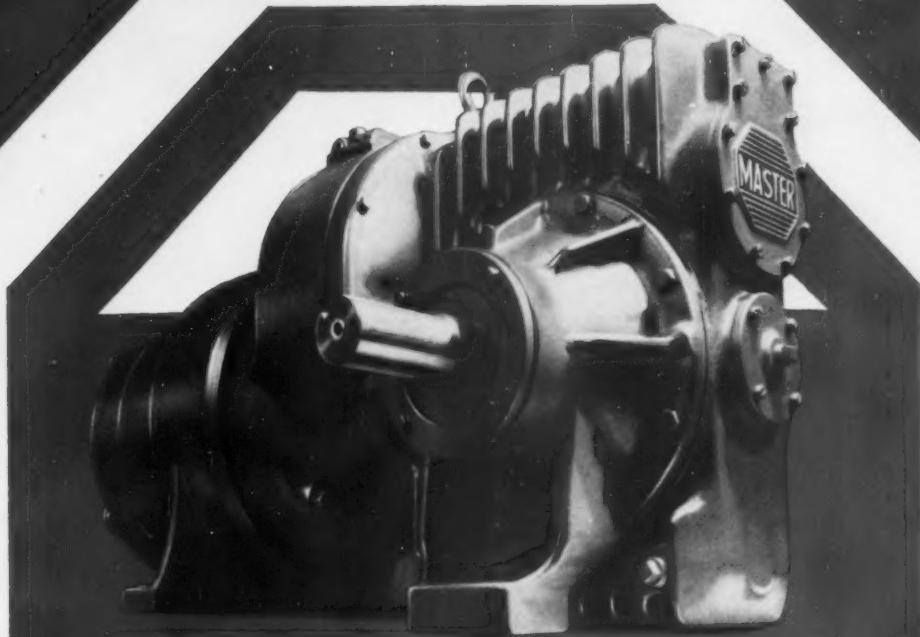


THE IRON AGE

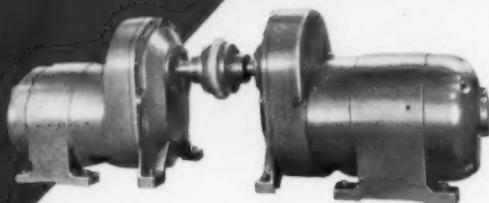


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Master Gearmotors have given more millions of hours of satisfactory service in the field than all other makes combined.



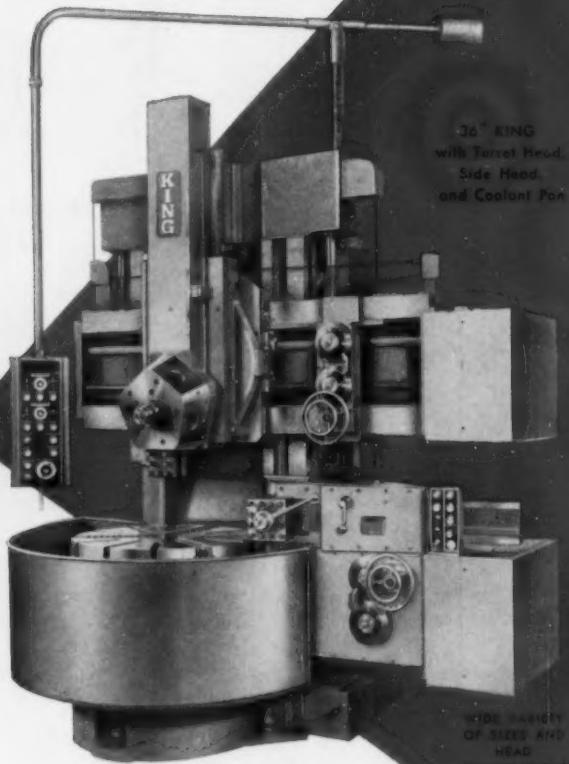
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Feed and rapid traverse movements
— and —

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for rail heads on machines with
two heads on rail . . . for rail head
and side head on machines with
one head on rail.

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direct-reading dial

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LOCATED ON SIDE HEAD PANEL—

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— and —

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from direct-reading dial:
on machines with two heads on rail.

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